SSN 0147-9725

MARYLAND BIRDLIFE

Avian studies in the Mid-Atlantic region

Bulletin of the Maryland Ornithological Society, Inc.

FALL 2021
VOLUME 70
NUMBER 2

MARYLAND ORNITHOLOGICAL SOCIETY, INC.

4915 Greenspring Avenue, Baltimore, MD 21209
http://www.mdbirds.org

CURRENT OFFICERS – FALL 2021

EXECUTIVE COUNCIL

President:	John McKitterick	john.mckitterick@mdbirds.org	410-997-3122
Vice-President:	Bonnie Borsa	bonnie.borsa@mdbirds.org	301-695-8214
Treasurer:	Carol Daugherty	cdaughertycpa@gmail.com	301-881-7544
Secretary:	Maryanne Dolan	maryanne.dolan@gmail.com	202-441-6676
Past-President:	Robin Todd	robintodd1948@gmail.com	410-491-5333

STATE DIRECTORS

Allegany & Garrett:	*Raquel Ketterman (vacant)	Howard:	*Mary Maxey Allen Lewis David Sandler Sherry Tomlinson
Anne Arundel:	*Chris Eberly Alan Christian Jim Collatz	Kent:	*Nancy Martin Walter Ellison
Baltimore:	*Joe Corcoran Joan Cwi Libby Errickson Mary Anne Fluke Mark Linardi	Montgomery:	*Evelyn Ralston Anne Mytych Dave Powell Ed Vigezzi
Caroline:	*Bill Scudder Danny Poet	Patuxent:	*Marcia Watson Ross Geredien
Carroll:	*CJ McAuliffe Don Jewell	Talbot:	*Bettye Maki Wayne Bell
Cecil:	*Maryanne Dolan Ken Drier	Tri-County:	*Mike Walsh Mary Huebner
Frederick:	*Bonnie Borsa Kathy Brown	Washington (Co.):	*Mark Abdy (vacant)
Harford:	*Joseph Stevens Diane Jones Dennis Kirkwood		

**Denotes Chapter President*

Active Member: $20.00 plus chapter dues
Household: $25.00 plus chapter dues
Sustaining: $50.00 plus chapter dues
Life: $1000.00 (4 annual installments)
Junior (under 18): $5.00 plus chapter dues

Cover: Two Bald Eagle eaglets (*Haliaeetus leucocephalus*) approximately four weeks old in the nest with an adult perched nearby. Mercer County Lake, Mercer County, New Jersey, 11 May 2019. Photographed by Kevin and Karin Buynie.

Maryland Birdlife 70(2):1

EDITOR'S NOTE

Ricki Norton, Our Outgoing Statewide Mid-winter Bird Count Compiler
After three years of dedicated service, Ricki Norton of the Montgomery Bird Club is stepping down as the Statewide Mid-winter Bird Count Compiler. The MOS and *Maryland Birdlife* thank Ricki for her service and we wish her success in her future endeavors.

Ikumi Kayama, Our Incoming Statewide Mid-winter Bird Count Compiler
It is my pleasure to introduce Ikumi Kayama of the Patuxent Bird Club as the new Statewide Mid-winter Bird Count Compiler. Ikumi is a medical and scientific illustrator and the owner of Studio Kayama LLC (http://studiokayama.com). She has taught bird illustration workshops at MOS conventions, has won three convention pin contests, and has judged the pin contests when she was not competing.

In Ikumi's own words: "I'm endlessly fascinated by how much birds teach us each and every time we appreciate birds near and far. Their artistry in song, colors and dance, adaptabilities and efficiencies in anatomy and physiology, movements big and small, transformations and development, social structure, family dynamics, communications, personalities, etc., etc. I've always loved birds ever since I was little, but since no one in my family was a birder (yet), I got to explore it all on my own, meeting new people and going to new places. The more I learn, the more I find it irresistible to share the fascinating world of birds through my sketches and illustrations. I've been a member of the Patuxent Bird Club (PBC) for several years and I currently serve on the board. I enjoy sharing the love for birds with the PBC members through club meetings and field trips, and I look forward to meeting birders throughout the state to continue learning about and finding delight in sharing space with our feathered neighbors."

Species List Order
Chesser, R.T., S.M. Billerman, K.J. Burns, C. Cicero, J.L. Dunn, B.E. Hernández-Baños, A.W. Kratter, I.J. Lovette, N.A. Mason, P.C. Rasmussen, J.V. Remsen, Jr., D.F. Stotz, and K. Winker. 2021. Check-list of North American Birds (online). American Ornithological Society. Available at: http://checklist.americanornithology.org/taxa.

Eugene J. Scarpulla
Editor
birdlife@mdbirds.org

Maryland Birdlife 70(2):2–22

Descriptions of Maryland Birds by Colonial Naturalist Henry Callister

Ellen M. Lawler[1] and Sarah A. Rubin[2]

[1]*412 Monticello Avenue, Salisbury, Maryland 21801;*
emlawler534@comcast.net
[2]*Tampa Bay Watch Discovery Center, 700 2nd Avenue NE, St. Petersburg, Florida 33701;*
srubin@tampabaywatch.org

Abstract: Although not a formally trained naturalist, colonial merchant Henry Callister had a strong interest in local natural history with a special fondness for birds. During the years that he lived on the Upper Eastern Shore of Maryland, 1742–1766, he wrote two essays dealing with nature. In addition, a few of his letters to family and friends on the Isle of Man contain references to nature and to sending live animals as gifts via ships crossing the Atlantic Ocean. In all, Callister's letters refer to over fifty different types of birds, include accurate descriptions of behavior, and his thoughts on topics such as migration and the ability of non-human species to adapt to their environment. Considering that there are relatively few published accounts of birds in Maryland from the colonial period, Callister's writings are especially valuable.

INTRODUCTION

Henry Callister (circa 1714–1766), a native of the Isle of Man, immigrated to the Eastern Shore of Maryland in 1742. From his arrival until 1759, he was employed as a factor (agent) for the Liverpool trading company of Foster Cunliffe and Sons, which maintained storehouses at five locations during these years. At various times, Callister worked at each of these locations: the firm's Maryland headquarters in Oxford; Cambridge; Newtown, now Chestertown; Townside, located across the Chester River from present day Crumpton; and a location at the head of the Wye River. When Foster Cunliffe and Sons closed their Maryland operations in 1759, Callister purchased their Townside storehouse. He tried, but was unsuccessful as an independent tobacco merchant. In 1765, he sold the store and retired to his farm across the Chester River in Queen Anne's County. He resided there until his death which is thought to have occurred in 1766 or shortly thereafter (Wroth 1911, Tilghman 1915).

Throughout his life, Callister kept drafts of the letters he sent. In addition to business letters, there are letters to family and friends; a number of these refer to Maryland birds and natural history. Little is known about Callister's early education, but the content of some letters and the titles of books in his extensive personal library demonstrate his interest in fields ranging from music and philosophy to history, politics, and geography as well as natural history (Wheeler 1942). After Callister died, his letters (now known as the Callister Papers, CP) were preserved by his widow and were eventually donated to The Episcopal Diocese of Maryland Archives in Baltimore where they are still available (Wroth 1911, Tilghman 1915). In 1932, photostated copies were made, put in chronological order, and numbered. The pages given for specific references are the page numbers of the photostated copies (Callister 1741–1788). These are available in the Maryland Room of the Talbot County Free Library in Easton and within the Episcopal Archives.

Among Callister's letters are two extended essays dealing with Maryland natural history; one which he titled "A Dissertation on Swallows" was written in 1761 (CP 414–422). The other essay, "Some account of the most remarkable Curiosities of Maryland; or the Rarities of the New World" (CP 170–177), is neither signed nor dated. Together these essays contain descriptions of thirteen species of birds, some detailed enough to indicate that Callister had firsthand experience with these species in the field and was an accurate observer of behavior. The "Curiosities" essay also includes a list of forty-five other types of birds, and both essays include Callister's thoughts on various natural phenomena.

With regard to quotations from Callister's letters, they follow the original copy and include his word usage, spelling, capitalization, abbreviations and punctuation (Figures 1, 2, and 3). For clarity and ease of reading, crossed out words and hyphens in words divided at the end of lines are not included. Words Callister wrote in superscript have been brought down and inserted where he indicated. Brackets surround words inferred from missing, illegible, partly illegible, or confusing misspelled words.

EXCERPTS FROM THE "CURIOSITIES" ESSAY (CP 170–177)

Although "Some account of the most remarkable Curiosities of Maryland; or the Rarities of the New World" is neither signed nor dated, it is in Callister's handwriting and style and was most likely written between 1755 and 1761. Neither its purpose nor desired audience is indicated, but the fact that Callister made many comparisons to European species, suggests it was written for an audience in England or Europe. In addition to the following bird descriptions, Callister also wrote about Virginia Opossums (*Didelphis virginiana*), Southern

Flying Squirrels (*Glaucomys volans*), dung beetles, snakes, and a variety of frogs and toads in the essay.

Summer Duck (Wood Duck, *Aix sponsa*)

Unfortunately, damage to this page has made portions of this description illegible, but Callister refers to the beauty of the drake and mentions that:

> "They build high in the Trees. … when the young are hatch'd they climb out of their hollow place as in the manner of wood peckers & boldly throw themselves down into the water or on the ground without receiving any Damage. Their sort easily becomes tame & I have now some of them living about the house with the Domestik sorts, but they are smaller than a pigeon."

The Buzzard or Vulture (Turkey Vulture, *Cathartes aura*)

Callister starts off by mentioning that with regard to carcasses "we have the finest contrivance Nature could have invented." He goes on to say (Figure 1):

> "They are about the bigness of a Turkey & resemble him in color & appear [appearance?] very much, they are long winged have a fine easy flight, you scarcely ever see them but when some hog Cow horse or other Carcass lies in the Marsh or in the Woods a Creature is no sooner dead than you see a flock of these birds skimming the air & ranging like a pack of hounds, evidently by the Nose toards the Carrion, they never fail to find it in a days time though they might be 20 miles off when the Creature dies, & immediately it is devour'd, let it be never so stinking. This bird has no Enemy, He never preys on living animals & it is said of 'em that when there's no Carrion to be had they will fill their Craws & feed their young with mudd & nastiness from the Swamp, & if food [illegible] in the meantime they will disgorge again. These birds stink intolerably dead or alive. They are vastly beneficial."

Two other colonial naturalists noted the Turkey Vulture's use of its sense of smell to locate carrion. Mark Catesby (1731) referred to the species' "wonderful sagacity in smelling" in the first volume of his *The Natural History of Carolina, Florida and the Bahama Islands*. Andrew Scott, a physician working in Prince George's County, Maryland, wrote about it in a 1739 letter to Royal Society of London member Hans Sloane (Frick et al. 1987). As it is doubtful that Callister had access to either of these, he most likely came to this conclusion independently.

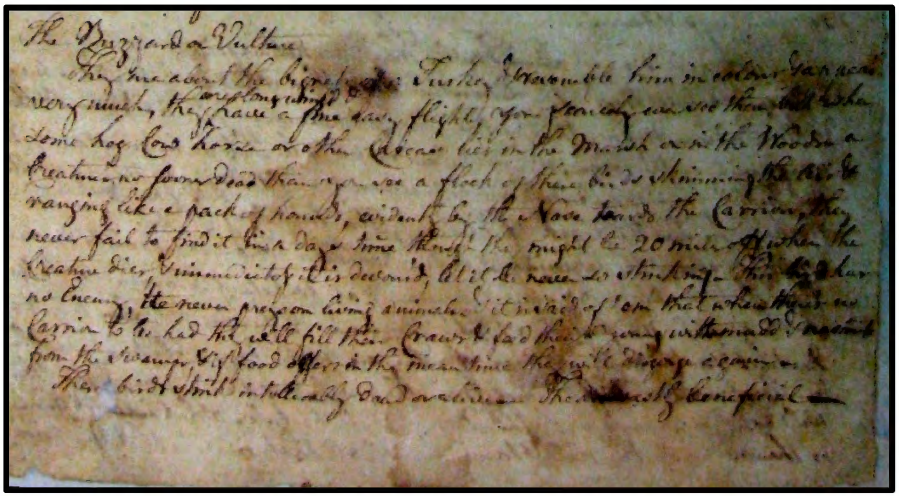

Figure 1. "The Buzzard or Vulture." Page 172 of the Callister Papers (1741–1788). Used by permission of The Episcopal Diocese of Maryland Archives, Baltimore, Maryland.

Fishing Hawk (Osprey, *Pandion haliaetus*)
Eagle (Bald Eagle, *Haliaeetus leucocephalus*)
Callister states:

"Fishing hawk, is abt. the Size of the Buzzard, somewhat less & resembles our large hawk in shape & in the order of his Colours only the mixture is rather gray than brown. He hovers in the air & plunges in the water to catch fish in the manner of the Gannet, but is never seen sitting on the water, & catches the fish in his Talons.

"The Eagle is somewhat larger than ours of dark blackish brown colour, his head & neck down to his shoulders & his tail quite to the Rump are snow white. When ever the Fishing hawk catches a fish, this Eagle who keeps watch at the distance of a mile & sometimes 2 miles immediately sets off after him, the hawk soon perceives he's pursued & makes off as fast as his he can carry such a burden, but is presently hurr'd by the swift Eagle & after a few turns high in the air he's forced to drop his fish which the Eagle immediately stoops at & takes in his talons & bears it away, he overtakes it as it falls without seeming to make any haste for it, so much quicker is his motion than the descent of the fish. The Hawk then pursues & strikes several strokes at him when loaded, as it were to vex him, for his stroaks [strokes?] never take Effect & so the Eagle makes off & feeds his Young.

> This is pretty Entertainment; as is likewise the Eagle stooping at a Duck in the River. When the Duck's underwater the Eagle sets off & gets over him before She rises & is ready to pick her up in his talons – he keeps hovering abt. the place & when the duck rises makes directly toards her, the poor duck dives Immediately to save itself & has hardly time to take a breath of air before the Enemy is up with her. I have seen an Eagle in this manner make 20 or 30 stoops at a duck & at last bear the poor thing away & sometimes I have seen the Duck hold out so well that the Eagle was obliged to quit the field, being quite tired with so many up & downs."

Although the habit of Bald Eagles to rob Osprey of their fish is described in other writings from the colonial period, including Robert Beverley's *History and Present State of Virginia* published in 1705 (Johnston 2003) and Catesby's *Natural History* (Feduccia 1985), Callister's prose suggests that his description is based on his personal observations.

Turkey (Wild Turkey, *Meleagris gallopavo*)

Callister states that:

> "The Turkey is a noble Fowl, There does not appear to be any other difference betwixt these & the Domestick [illegible] than what is betwixt the Europ [European] & the Indian Men, that is the Savage appearance of their Nature & the uniformity of the Colour, which indeed seems to be the Case in most animals … we frequently see the Wild Turkeys here mix their breed with the Domestick become tame & change colours. I sent a Cock & a hen of them to England a few Years since which indeed retain'd the Wild Colour, but were as absolutely reclaim'd as any tame Turkeys & had lived abt. the house with them. The Wild ones generally weigh abt. half as much more as the tame."

Callister continues to discuss the ability of various domesticated animals (chickens, rabbits, goats, and pigs) to interbreed with their wild counterparts. He states that "there's no room to doubt but by cohabiting with one another or living amicably together, they would soon become variegated … & in a little time leave no mark of distinct species"

Colibry or Humming bird (Ruby-throated hummingbird, *Archilochus colubris*)

Martin (Purple Martin, *Progne subis*)

As they are so different from any European species, Ruby-throated Hummingbirds were commonly mentioned and praised in early literature regarding North American birds (Jones 1699, Lawson 1709, Feduccia 1985, Johnston 2003). Callister begins his description with a long quote from Pluche's *Spectacle de la Nature* (1750) about the physical appearance of the

hummingbird known in France as le Colibri. (Although Pluche lived in France, his eight-volume work deals with species from various parts of the world.) Callister then continues with his experience with the species:

> "These little Creatures have a louder voice than one would imagine; they venture very close to one when on the wing but are inaccessible when you move towards them. I have caught several of them with ease while they were rummaging the bottom of the flowers; my method was to stand at the end of a flower border; he begins in the manner of the bee, to rifle the flowers, at one End of a border constantly humming on the wing from one flower to another till he comes up to you & never minds you while you stand stock still, so you may catch at him as you do at a ball at Fives I have had several Nests of them with two young ones in each which I have kept abt. 2 months, the [they] gape like other young birds & are satisfied with sugar & water with a quill cut like [illegible] scoop, as soon as full feathered they hum abt. the Cage immediately & become very tame [&?] familiar; they always died with me by their feathers catching the honey drops & sugar in the Cage wh. distrid them too much. I am inform'd that Mr. Bladen our late Goverinor carried one of them alive to England in a glass Lanthern. The whole bulk of their Nest is about the size of a Goose Egg but the inside not of the Capacity of a hen Egg shell. It is altogether made of Moss of various sorts; the inside resembling a fine silky down & the outside exactly like the fine moss of trees & seems yet to be growing to the tree. as to what is said in the History of the British Empire & else where of their fine singing & sweet scent, I never heard or perceiv'd either, others have said they are never seen standing, but it is very common to see them standing if you watch when they quit the flowers, otherwise the Eye cannot easily find them on a tree. The above cited author says likewise that these birds are only found in America, but I remember to have seen in some of the Magazines a Description of another sort of Humming bird not less curious than this, but I don't remember that he says what Country produces it. The Humming bird is moreover twice the length of the largest fly I have yet seen & something thicke [somewhat thicker?] in the Body. As to the sweet scent they are said to have it may proceed from the spices they [the] dead ones are stuff'd with when sent to Europe, our method is to put into their body a grain of Pymento wh. will preserve them from corruption, otherwise the feathers will all drop off in a little time – or they may be dried in the Sun. Those in Mexico may for ought I know have a sweet odour wh. may proceed from some peculiarity in the flowers they feed on in that part of the world, which are more strongly odoriferous than those of our Northern Climes."

In response to Pluche's discussion of female hummingbirds vigorously defending their young from other birds, Callister relates an episode in which he

was surprised by a Purple Martin flying quickly past him, crying out and being pursued by a hummingbird. He writes:

> "Now the martin being a very inoffensive bird to all but the Hawks, wh. he is an instant Enemy to, tho not on his own accot. but as it were to oblige the family who have built him a summer house to breed in, I say this Martin is a great devourer of Bees, & I suppose a large bee & young humming bird sucking the flowers of one & the same plant the Martin striking at the Bee may have jostled against the young humming bird & knocked it down in the presence of it's Dam & thence must ensue some Resentment."

The final page of this essay includes Callister's lists of birds, beasts (mammals), insects, fish, trees, and "herbs and plants." With regard to birds:

> "Among an infinity of birds & many that bear the European Names The Eagle, the variety of Hawks, Ducks, Geese, Swans Pigeons, Doves, Swallows, Martins, woodcocks snipes woodpeckers Cormorant, jay, tril, redshank, Kingfisher – owls seamews purrhs Sparrows, Parrot, Pheasants Patridges Goldfinches, green finches, Nightingales black Caps thrushes plovers, skylarks sea larks woodlarks Turkeys Herons Crows Tomtits wrens sea pies & many others of most of which we have various kinds among all them I know none of the same species with the European but the followin seven sorts 1. Duck & mallard 2. Great Gull 3. Raven 4. Great Heron - we have 2 other sorts [with?] a smaller wh. is snow white & one less than a pigeon like the Great one in form 5. House Swallow 6. Great Swan – We have likewise a small sort 7. Curliew."

For a number of the birds listed, such as woodcocks, snipes, and cormorant, it is not difficult to recognize the species to which Callister was most likely referring. In others cases, he uses general terms, hawks, ducks, geese, etc., to refer to multiple species. The phrase "Duck & mallard" most likely refers to Mallard (*Anas platyrhynchos*) as in colonial times, Mallard was applied to the male and duck to the female of that species (McAtee 1953, 1957). Callister lists a "Great swan" and "likewise a smaller sort", perhaps referring to Trumpeter Swan (*Cygnus buccinator*) and Tundra Swan (*Cygnus columbianus*). John Lawson's list of birds of North Carolina (1709) includes two swan species and Trumpeter Swans are included on a number of coastal Virginia bird lists as late as 1835 (Johnston 2003).

A number of the names on Callister's list, including "skylarks, sea larks and woodlarks", likely refer to songbirds. Although there are no North American species especially similar to the Skylark (*Alauda arvensis*) or Woodlark (*Lullula arborea*) of Europe, perhaps Horned Lark (*Eremophila alpestris*) is one of the species he had in mind. The term sea-lark was sometimes used to refer to the

smaller *Calidris* species of sandpipers (Allen 1951), so that is also a possibility. As Callister included both "black Caps" and "Tomtits" on the list, tomtit likely refers to Tufted Titmouse (*Baeolophus bicolor*) (Choate 1973, Feduccia 1985) and black cap to Carolina Chickadee (*Poecile carolinensis*). The Blackcap (*Sylvia atricapilla*), refers to an unrelated species, but as Callister recognized, European names were frequently and inappropriately applied to unrelated birds at the time. Although redbird was a common name for Northern Cardinal (*Cardinalis cardinalis*) in colonial times (Trotter 1909, McAtee 1957), and Callister used that name in some of his letters, the name Virginia Nightingale was also applied to this species at this time (McAtee 1953, 1957). So, Callister's use of "Nightingales" here may refer to our cardinal or possibly to Northern Mockingbird (*Mimus polyglottos*) as it was sometimes given that name in colonial times (Allen 1951). No other use of the term "tril" has been found, but it may have been his name for a passerine with a trill-like song and his term "green finches" could refer to any one of a number of birds, including warblers, vireos, or flycatchers.

The list includes both "Pheasants" and "Patridges" as does the 1705 bird list of James River resident Robert Beverley (Johnston 2003). Callister's "Patridges" most likely refers to Northern Bobwhite (*Colinus virginianus*). There is no doubt that Catesby's partridge illustration in his Natural History is of a bobwhite (Feduccia 1985) and partridge is thought to refer to that species on the Virginia lists of Glover and Clayton (McAtee 1953). It is unlikely that "Pheasants" refers to Ring-necked Pheasant (*Phasianus colchicus*) which was not established in the mid-Atlantic region at that time, despite wealthy planters releasing English game birds on their estates as early as the seventeenth century (Johnston 2003). Two other gallinaceous birds, Ruffed Grouse (*Bonasa umbellus*) and Heath Hen, (*Tympanuchus cupido* cupido), the now extinct eastern race of Greater Prairie Chicken (*Tympanuchus cupido*), are possibilities. Some scholars have assumed that pheasant on colonial bird lists refers to Ruffed Grouse (Allen 1951) and that species has been documented, although rarely, on Maryland's Eastern Shore (Stewart and Robbins 1958). On the other hand, the historic range of Heath Hen extended into the mid-Atlantic region, and that species has been documented on Maryland's Coastal Plain, which has habitat more conducive to it than Ruffed Grouse (Stewart and Robbins 1958). The term "Heath-cock" appears on an anonymous 1649 Virginia bird list and "Heath fowls" is on the 1739 list of Virginia botanist John Clayton (Johnston 2003). Holt (2006–2009) suspects that "pheasant" on Thomas Jefferson's bird list (1788) refers to Heath Hen. It seems more likely that Callister was referring to Heath Hen than to Ruffed Grouse on his list.

There are three terms (and perhaps a fourth) on Callister's list that likely refer to shorebird species. "Curliew" may refer to the once common, but now extinct Eskimo Curlew (*Numenius borealis*) which occurred irregularly on the Eastern

Shore of Virginia (Johnston 2003) and the Eastern Shore of Maryland as late as 1913 (Stewart and Robbins 1958). But Whimbrel (*Numenius phaeopus*) is also a candidate (McAtee 1953) and during the colonial period, this name was sometimes applied to other large shorebirds and even to ibis species (McAtee 1957). It is possible that Callister used the term "redshank" for either Greater (*Tringa melanoleuca*) or Lesser Yellowlegs (*Tringa flavipes*) as they are the two *Tringa* species in America most superficially similar to the Redshank of Europe (*Tringa totanus*). Callister's term "sea pies" likely refers to American Oystercatcher (*Haematopus palliatus*). Catesby used the term sea-pye to refer to the Eurasian Oystercatcher (*Haematopus ostralegus*) and Alexander Wilson used the name Pied Oystercatcher for the American species (McAtee 1957, Burns 1909). It is possible that "purrhs" on Callister's list is a misspelling of purres, referring to another shorebird. Purre is an Old English term for Dunlin (*Calidris alpina*) in winter plumage and used by Wilson to refer to that species (Burns 1909).

With regard to waders, Callister included "Great Heron" on his list of seven species with European names he thought were indeed the same species as the European forms. This is most likely our Great Blue Heron (*Ardea herodias*) which, although not the same species, is very similar to Europe's Grey Heron (*Ardea cinerea*). Callister referred to two other sorts, one smaller and "snow white" (possibly Great Egret [*Ardea alba*] or Snowy Egret [*Egretta thula*]), the other "less than a pigeon like the Great one in form" (possibly Green Heron, [*Butorides virescens*]). The term seamews was historically applied to gull species (Allen 1951), so although Callister included "Great Gull" (likely referring to one of the larger gull species) later in the list, it is likely that "seamews" also refers to gulls.

It is not clear whether Callister observed all the species on this list himself or whether he knew them to be found in Maryland. For instance, the list includes both "Crows" and "Raven." Whether Callister meant that Common Ravens (*Corvus corax*) occurred on the Eastern Shore at that time or whether they were simply found in some part of Maryland is unclear. However, the colonial lists of Lawson in North Carolina (Lawson 1709) and Rev. Clayton in Virginia (McAtee 1953) contain both raven and crow. And in his "Swallow Dissertation", Callister commented on a difference between nesting habits of ravens on the Isle of Man, where they nested on rocks and in Maryland, where "for want of rocks, they build in trees" (CP 416), suggesting that he had directly observed ravens in Maryland.

"Parrot" likely refers to the now extinct Carolina Parakeet (*Conuropsis carolinensis*). Although rare in the Mid-Atlantic region even in the colonial period (Johnston 2003), there are a few historic reports from Maryland (Stewart and Robbins 1958). Callister's list includes both "Pigeons" and "Doves"

suggesting that Doves refers to Mourning Dove (*Zenaida macroura*) and Pigeons to another extinct species, Passenger Pigeon (*Ectopistes migratorius*) which is known to have occurred in Maryland. Among the latest records in the state is one from Dorchester County in the 1880s (Stewart and Robbins 1958).

EXCERPTS FROM "A DISSERTATION ON SWALLOWS" (CP 414–422)

In July 1761, Callister penned a letter to business associate Clement Sewell, a resident of Maryland, in response to five questions posed by a Dr. Chandler. The identity of Dr. Chandler has not been established, but a strong possibility is Rev. Dr. Samuel Chandler who was a Fellow of the Royal Society of London at that time. Dr. Chandler's questions related to the migration as well as diversity of swallows in Maryland. In his response (Figure 2), Callister described seven species of birds (four swallows and three now known to not be swallows) comparing them with European swallows described by John Hill in his *An History of Animals* (1752). Therefore, some of Callister's descriptions are brief, but others more detailed. Whereas Hill's descriptions are based exclusively on external anatomy (suggesting he was working from dead specimens), Callister's descriptions often include aspects of the species' behavior (suggesting he had experience with them in the field). In addition to the birds described below, Callister named two other birds that he recognized as migratory species, snow bird and fieldfare. In colonial times, these names were commonly used for the Dark-eyed Junco (*Junco hyemalis*) and American Robin (*Turdus migratorius*) respectively (Trotter 1909). (For more on Callister's swallow dissertation, see Lawler and Rubin 2014.)

Common house swallow (Barn Swallow, *Hirundo rustica*)

Callister states that the common house swallow "differs in nothing from that in Europe, whither in form, size, colour, voice, or manner." Hill's description (1752) of the species' external anatomy fits well with the species currently known as Swallow in Europe and as Barn Swallow in America. Callister also comments on the species' ferruginous throat and use of mud in building their nests.

Martlet, sand martin, bank martin, or bank swallow (Bank Swallow, *Riparia riparia*)

Callister correctly states that this species "differs little from that known by the same name in England; he has chirps, but no soung [song], the same in size colour, vice [voice] & manner of flight." With regard to nesting, the species "scrapes a hole two feet or more in the sand bank, & fills his nest with sticks, straws & feathers."

The swallow tribe do not seem to be fit for the pot, and therefore
The several species of Swallows known in Maryland
The common house Swallow
The Martin
The Martlet, and Martin or bank Swallow
The Caprimulgus, called in Maryland, the Whip-poor-will

Figure 2. "A Dissertation on Swallows." Page 414 of the Callister Papers (1741–1788). Used by permission of The Episcopal Diocese of Maryland Archives, Baltimore, Maryland.

Black martin or Martin (Purple Martin, *Progne subis*)

Callister's description demonstrates that he was well acquainted with and especially fond of martins. And, although he complains that most residents of Maryland "hardly know any distinction of the species of Animals but from their bulk & the nourishment their flesh affords", it appears that other local residents were also fond of this species:

> "As we have not the Starling, the sparrow and other domestic birds of Europe, we are particularly fond of the martin some old women imagine the

> [they] keep the hawk from their chickens, We prepare boxes near our houses for their reception in the spring; sometimes a large Caster on the top of a pole, filled with apartments in the manner of a pigeon house, which they immediately take possession of & occupy to what number we please to provide holes for without limitation, They have a short mirry warbling song not very sweet however, which they repeat a thousand times a day … I have at the time I expected the martin, looked out on a fair spring morning, and many times with pleasure seen a pair or two pop in to view & examin the boxes of their old Colony. After this they ramble for a few days, as it were to collect their forces; for these are sociable as pigeons, and when a number is assembled, they set to work to repair their nests."

With regard to the arrival of martins in the spring, Callister writes:

> "The Black martin makes his appearance about the midle of March, a few at a time, those who come first often find the [they] were two [too] hasty; they seem to suffer sometimes by the severity of the cold and sun themselves on the sides of the house roofs. As the Martin seems to be the hardiest of the whole class: by his being the earliest Visiter, accordingly he stays longer with us, and bids us adieu about the latter end of August."

Another swallow of passage (Tree Swallow, *Tachycineta bicolor*)

Towards the end of the essay, Callister mentions another species which he did not link to any of those described by John Hill. This bird is:

> "an itinerant, no resident of Maryland, he stays not above two or three day I suppose they came from some northern Countries, they pass by in large flocks late in September, they are very fleet, the [they] resemble the martin, not quite so big, they are white underneath & are mute. This is all I know of them, (for I never handled them) but that they are evidently of the Swallow Tribe."

Although brief, this description of Tree Swallow may be one of the earliest written descriptions of this species which is absent from colonial bird lists (Allen 1951) and was not named and scientifically described until 1807 by Vieillot (1807).

Chimney swallow (Chimney Swift, *Chaetura pelagica*)

Callister was not alone in classing this species with the swallows; naturalists of the time including Peter Kalm and J. R. Forster referred to the Chimney Swift as a swallow (Graves 2004). Callister describes them as flying "in pairs, both at the same time alternately vibrating, their wings with a quick motion & then skimming the air in a paralell motion & chirping without any musical taste or

change of note." With regard to nesting, Callister states that this species "seldom appears till we foresake the fireside" and then:

> "pops down perpendicularly into our Chimneys, and there at some distance from The top, without any mud, he begins and fastens together, with the gum of Cherry trees, peach and plum trees, a number of small sticks in a Horizontal manner, something in the form of a basket, and without laying any other materials, lodges its Eggs and raises its young there; It often happens; when the chimneys have been foul with soot, the weight of the young ones brings down nest & all upon the hearth. These had not chimneys to [missing word?] in the state of Nature; but they had hollow trees, & such they have recourse to at this day, tho they seem to like the chimneys best."

Callister's last comment supports the position of Graves (2004) that the nesting preference of Chimney Swifts for man-made structures developed soon after the start of European settlement in North America. In addition to citing the preference of "chimney swallows" for manmade structures, Callister also comments on the use of manmade fibers in nest building by other birds (most likely one of the orioles) in this passage:

> "We have birds in this Country who hang their nests to to [sic] the ends of the boughs of trees, the ropes they hang by something resemble the strings of a Negro's purse for, a foot or more in length of spun thread of flax or hemp, which they twist round the branch of the tree perfectly secure. Now these materials I have seen them pick from before the doors of the inhabitants, and they are such as nature did not furnish them."

King martin (Eastern Kingbird, *Tyrannus tyrannus*)

In a postscript to his swallow dissertation, Callister describes "another small bird we have here, commonly called the King martin":

> "When I had closed my letter; I procured one of them to be shot for Hills examination, and find by Hills classical character of the hirunds, he must be one, altho he differs in many respects; his whole upper part is blackish & his whole under part white, the Eyes, bill & feet are black, his throat is not so wide as any of the other species, his head not quite so flatt, his tail is not forked nor his wings, long; his flight is continuously by a quick vibration of his wings, and he [playes?] frequently in the air by fits, starts & short turns, with a chattering noise without any taste. He builds his nist [nest] with sticks, which he lays on a bare part of some tree. He is very quarrelsome and [drives?] fiercely at any other bird, he even picks among their feathers & torments them especially hawks & crows. He feeds on flies & often on raptiles [reptiles?] which he picks off the ground by suddenly darting at

them, not by walking or hopping in quest of them. He always perches on some fence, post or dry & exposed part of the trees. They do not live in societies, but each pair has its distinct airy like the hawks. They come about the time of the common swallow & depart in the like order."

Callister was not alone in placing Eastern Kingbird with the swallows; Wilson mentioned that in Maryland the species was referred to as field martin (Trotter 1909). In an unpublished account, Thomas Jefferson called it the Feild-martin [sic] or Star-martin and gave it the scientific name *Hirundo stellate*. He was unaware that the bird he observed was a species already described and named by Catesby and Linnaeus (Halley 2018). Callister's use of the term raptiles is interesting. He is most likely referring to reptiles, but, although frogs have been noted as an occasional diet item of Eastern Kingbirds, no mention of reptiles in their diet has been documented (Murphy 1996).

Caprimulgus, called in Maryland the East India Bat (a species of nightjar, Caprimulgidae)

In his *An History of Animals*, John Hill (1752) grouped the goatsucker, now Nightjar (*Caprimulgus europaeus*), in his Hirundo section, stating that other authors "separated it from its true and proper genus and put it with the owls." As Callister was using Hill's work as a baseline, he also placed his Caprimulgus with the swallows although he states that no one but "so competate [competent?] a Naturalist as Hill woud dare to class with the swallows." Callister's description is so brief that it is difficult to determine to which of the three species found in Maryland he was referring. He states simply that the Maryland bird "differs in nothing" from the European species described by Hill. The fact that Hill's description was based entirely on external anatomy, suggests that Callister is likely referring to either Eastern Whip-poor-will (*Antrostomus vociferus*) or Chuck-will's-widow (*Antrostomus carolinensis*) as they are more similar in that regard to the Nightjar than is the Common Nighthawk (*Chordeiles minor*). Catesby's two illustrations of caprimulgids indicate that he confused the characteristics of the three species and both he and Lawson used the name East India Bat to refer to caprimulgids (Feduccia 1985, Lawson 1709).

In his swallow dissertation, Callister included times for the arrival and departure of some species in Maryland, but as they are fairly imprecise, it seems he was relying on memory, rather than journals or records (Lawler and Rubin 2014). He also shared his thoughts regarding the debate as to whether swallows migrate or spend the winter in hibernation. Although migration was recognized in many species of birds at that time, the possibility of swallows hibernating submerged in mud along waterways was argued even into the nineteenth century (Lewis 2005). Callister was strongly in favor of the migration theory. He reasoned that migration is known in other bird species, that swallows' wings are "remarkedly fitted for great and distant flight" and, as their diet is primarily flying insects, it

makes sense that they migrate at the proper times to locations where insects are abundant:

> "We must not doubt then that they migrate, & that into very distant countries or rather climes, for it is always North or South, and altho we see them collect themselves in very numerous flocks (as in general all birds of passage do) a little before the [they] Vanish, with out our perceiving when they take their flight, which probably is done in the night & by moon light."

Although Callister was correct in that most passerine species migrate at night, swallows, which feed on the wing, migrate during the day (Leahy 2004).

Callister commented on the navigational ability of animals, "Be the Country they remove to never [ever?] so far off and the track Unmarked, this is no difficulty with them … All this does not seem to be done by scent, but rather by some sixth sense of which we have no idea." He had an interesting hypothesis regarding the nesting of migrants as compared to year-round species of birds. Callister reasoned that as the number of individuals in both types of birds are fairly similar, and that as year-round resident birds routinely have more than one brood in a season, that migratory birds likely have a second breeding season in their winter habitat. As they "arrive at a proper time on the other side the Equator; when another spring commences, while they are absent from us, & we think no more of them, they raise a second brood; thus they are in their generation on a par with the hardier tribes that remain with us." Although this hypothesis has not been borne out for the vast majority of migratory species, it is interesting that a study of neotropical migratory birds documented "migratory double breeding" in five species (Rohwer et al. 2009).

REFERENCES TO BIRDS IN LETTERS TO FRIENDS AND FAMILY

In addition to these two essays, Callister made references to birds in a number of letters to friends and family on the Isle of Man. These letters include a few bird names not used in the above essays, notably redbird, bluebird and mockingbird which likely refer to Northern Cardinal, Eastern Bluebird (*Sialia sialis*), and Northern Mockingbird respectively. A number of the letters refer to sending or wanting to send live birds across the Atlantic. For instance, in a letter to his brother Ewan dated 11 January 1744 (CP 12), Callister states "If it were not troublesome to some Friend in Liverpoole I should send some rarity home as Squirrells, red birds, blue birds, humming birds, & c. … there are infinite varity [variety] here & it's a pity but some might be sent home." Callister's letter to friend Billy Tear in November 1746 (CP 78) indicates that he was sending a "fox squirrell" for Billy's "little one to play with." This presumably refers to the Delmarva Peninsula Fox Squirrel (*Sciurus niger cinereus*). He then stated that "we have many much prettier things but the [they] are tender, this sort of

squirrell is the hardiest creature I know of to send to Sea." It seems that either the squirrel did not make the voyage or died afterward as in August 1747, Callister (CP 100) wrote he was "vex'd" when he heard of the death of the squirrel (Figure 3). He mentioned having once sent a mockingbird to Liverpool that did not survive the voyage, although a "white Crow" he sent at the same time did survive. Callister also ordered live European song birds to be shipped to him. In an order placed with London merchant Anthony Bacon in February 1745, he requested "6 neat Lark Linnet or Goldfinch Cages, and (if the Captn. will be so good to take care of them) 6 [illegible] singing birds" (CP 30). It appears that Callister was more successful exchanging seeds and roots of plants (of which he was also fond) across the Atlantic (CP 78).

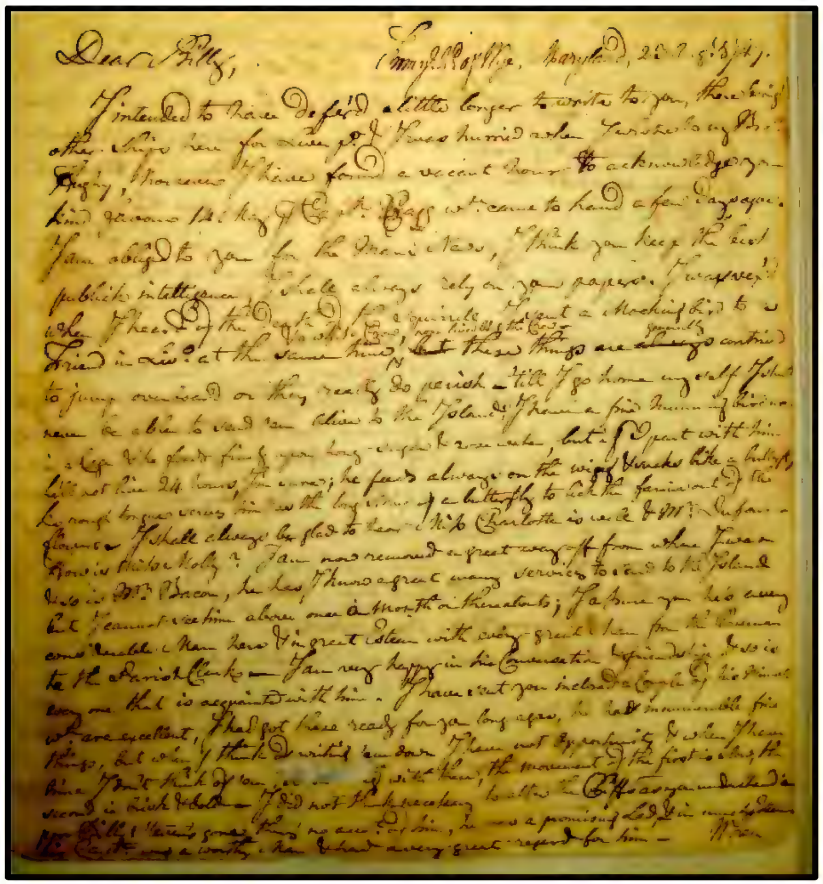

Figure 3. "Dear Billy" Letter. Page 100 of the Callister Papers (1741–1788). Used by permission of The Episcopal Diocese of Maryland Archives, Baltimore, Maryland.

DISCUSSION

Although there was intense interest in the natural history of North America among members of the Royal Society of London and others in Europe during the colonial period, specimens and information coming from Maryland are sparse as compared to colonies further south. Multiple lists of birds from seventeenth century Virginia, including the extensive list of Rev. John Clayton published in 1693, are available (Clayton 1693, Johnston 2003). Lawson's *A New Voyage to Carolina* (1709) and Catesby's *The Natural History of Carolina, Florida and the Bahama Islands* (1731), both published in the early eighteenth century, include substantial bird lists for those locations. No similar publications about the birds of Maryland from that period exist. In the late seventeenth century, members of the Temple Coffee House Botany Club sponsored and sent three naturalists to Maryland, to collect specimens, particularly plants. Rev. Hugh Jones collected specimens while serving as pastor of Christ Church, in Calvert County from 1696–1701, and William Vernon and Dr. David Krieg, working independently, collected in Maryland during 1698. Of the three, Krieg appears to have been the only one who collected on the Eastern Shore, in the vicinity of Oxford (Frick et al. 1987). Although short descriptions of the "humbing bird" and "mocking Bird" by Jones were published (Jones 1699), for the most part the specimens collected by these three naturalists were sent to their patrons in England with little or no descriptions, even at times lacking identification of the locations where they were found (Frick et al. 1987). In the eighteenth century, British naturalist Peter Collinson corresponded with a few Maryland residents, but little information about Maryland birdlife from those letters was published (Breslaw 2018). A few specimens collected in Maryland were used as references for major ornithological works published in Europe by George Edwards and Thomas Pennant in the mid-eighteenth century (McAtee 1950, 1963). Among the few publications from colonial Maryland that mention birds are the poems of Annapolis poet and teacher, Richard Lewis, who mentions plover, blackbird, and "whip poor will" in one poem and describes and praises the beauty of hummingbirds in another (Lemay 1972).

The paucity of information about birds from colonial Maryland makes Callister's writings, particularly his perceptive descriptions of behavior, especially valuable. Furthermore, the ability of Callister to use his observations to contemplate and develop general concepts regarding natural phenomena is demonstrated in a number of passages. For instance, he realized that although many Maryland birds were given names based on their resemblance to Old World species, they were indeed distinct species. He recognized the ability of domestic species to interbreed with their wild counterparts and felt strongly that, like humans, other animals were able to adapt to specific circumstances in their environment. In addition to giving examples from the nesting habits of swifts,

ravens, and orioles, he compared the coneys (rabbits) of Maryland with those of Europe which burrow underground:

> "We have the Coney here in abundance; but he never burrows; it is impracticable in a forrest country where there is not or rather sometime ago, was not an inch of ground unoccupied by the roots of trees & shrubs, & of course impenetrable to so soft a foot; But they find hollow trees in abundance with a small hole near their root and where these fail, they have recourse to the thicket, & watch as the hare. I could give a thousand instances, where the brute kingdom accommodate themselves with very good reasons to the difference of circumstance." (CP 416).

Callister logically explained his reasons to support migration rather than hibernation as the explanation for the disappearance of swallows in winter, recognized the ability of migratory birds to navigate and even proposed a hypothesis that migrant species had a second breeding season in their winter range. Many of these ideas are remarkably advanced for seventeenth century America.

A year after arriving in Maryland, Callister wrote to a friend in Liverpool, "Nothing less than a Whole Volume could give a Catalogue of the rarities of this new World." (CP 7). Unfortunately, Callister never was able to accomplish that; doubtless he was kept busy by his duties as a merchant, husband and father. The fact that, despite this and a lack of formal training in natural history, he was able to observe, reflect and write about local birds, their behaviors, migration and adaptability, is quite remarkable. One wonders if he had been supported by a patron or at least established correspondence with natural philosophers in England whether he would have made a significant contribution to the literature about Maryland's natural history. As it is, thanks to the preserved letters of Henry Callister, we have a glimpse into the mind of a remarkable amateur naturalist and the birds of colonial Maryland.

ACKNOWLEDGMENTS

We are indebted to the late Dr. Robert McFarlin who first introduced us to The Callister Papers. We are grateful to student researchers Brittney Uhland, Ashley Van-Veen, and Brianna Beauchamp, and to Mary Huebner and two anonymous reviewers for their thoughtful reviews and helpful comments. The able assistance of Becky Riti (Maryland Room Librarian, Talbot County Free Library, Easton, MD) and Mary O. Klein (Archivist, The Episcopal Diocese of Maryland Archives, Baltimore, MD) is appreciated and we are very grateful to William Belcher Cooley and Charles Cox Hooper, who in 1932 copied and indexed The Callister Papers.

LITERATURE CITED

Allen, E.G. 1951. The history of American ornithology before Audubon. *Transactions of the American Philosophical Society* New Series—41(3):387–591.

Breslaw, E.G. 2018. Enlightened Marylanders: Scientific interests of pre-revolutionary times. *Maryland Historical Magazine* 113(1):5–19.

Burns, F.L. 1909. Alexander Wilson. VI.—His nomenclature. *The Wilson Bulletin* 21(3):132–151.

Callister, H. 1741–1788. The Callister Papers. Unpublished papers, housed at The Episcopal Diocese of Maryland Archives, Baltimore, MD. 868 pp.

Catesby, M. 1731. *The Natural History of Carolina, Florida and the Bahama Islands*, Volume 1. Published by the author, London, UK. 100 pp. Available at: https://www.biodiversitylibrary.org/item/126524#page/7/mode/1up. Accessed 13 July 2021.

Choate, E.A. 1973. *The Dictionary of American Bird Names*. Gambit, Inc., Boston, MA. 261 pp.

Clayton, J. 1693. I. Mr. John Clayton, rector of Crofton at Wakefield, his letter to the Royal Society, giving a farther account of the soil, and other observables of Virginia. *Philosophical Transactions* 17(206):978–998. Available at: https://royalsocietypublishing.org/doi/pdf/10.1098/rstl.1693.0078. Accessed 28 July 2020.

Feduccia, A. (Editor). 1985. *Catesby's Birds of Colonial America*. The University of North Carolina Press, Chapel Hill, NC and London, UK. 176 pp.

Frick, G.F., J.L. Reveal, C.R. Broome, and M.L. Brown. 1987. Botanical explorations and discoveries in colonial Maryland, 1688 to 1753. *Huntia* 7:5–60. Available at: https://www.huntbotanical.org/admin/uploads/03hibd-huntia-7-pp5-60.pdf. Accessed 28 July 2020.

Graves, G.R. 2004. Avian commensals in Colonial America: When did *Chaetura pelagica* become the Chimney Swift? *Archives of Natural History* 31(2):300–307.

Halley, M.R. 2018. Jefferson's ornithology reconsidered. *Proceedings of the American Philosophical Society* 162(3):231–258.

Hill, J. 1752. *An History of Animals*. Printed for Thomas Osborne, in Grays-Inn, London, UK. 584 pp. Available at: https://books.google.com/ books?id=ctx

ZAAAAcAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false. Accessed 28 July 2020.

Holt, J. 2006–2009. The first American bird checklist. *Cassinia* 72–73:16–26. Available at https://dvoc.org/wp/wp-content/uploads/2016/12/C72_73First Checklist.pdf. Accessed 6 June 2020.

Jefferson, T. 1788. *Notes on the State of Virginia.* Prichard and Hall, Philadelphia, PA. 244 pp. Available at: https://docsouth.unc.edu/southlit/jefferson/jefferson.html. Accessed 3 June 2021.

Johnston, D.W. 2003. *The History of Ornithology in Virginia.* University of Virginia Press, Charlottesville, VA and London, UK. 219 pp.

Jones, H. 1699. V. Part of a letter from the Reverend Mr. Hugh Jones to the Reverend Dr. Benjamin Woodroofe, F.R.S. concerning severable observables in Maryland. *Philosophical Transactions* 21(259):436–442. Available at: https://royalsocietypublishing.org/doi/pdf/10.1098/rstl.1699.0078. Accessed 28 July 2020.

Lawler, E.M., and S.A. Rubin. 2014. "A Dissertation on Swallows" with comments on their migration by the eighteenth-century Maryland naturalist, Henry Callister. *Archives of Natural History* 41(2):280–293.

Lawson, J. 1709. *A New Voyage to Carolina.* London, UK. (Revised edition, 1967, edited by H.T. Lefler). The University of North Carolina Press, Chapel Hill, NC. 305 pp.

Leahy, C.W. 2004. *The Birdwatcher's Companion to North American Birdlife*. Princeton University Press, Princeton, NJ and Oxford, UK. 1039 pp.

Lemay, J.A.L. 1972. *Men of Letters in Colonial Maryland.* The University of Tennessee Press, Knoxville, TN. 407 pp. Available at: https://trace.tennessee.edu/cgi/viewcontent.cgi?article=1008&context=utk_early-american. Accessed 28 July 2020.

Lewis, A.J. 2005. A democracy of facts, an empire of reason: Swallow submersion and natural history in the early American republic. *The William and Mary Quarterly* 62(4):663–696.

McAtee, W.L. 1950. The North American birds of George Edwards. *Journal of the Society for the Bibliography of Natural History* 2(6):194–205.

McAtee, W.L. 1953. North American bird records in the "Philosophical Transactions," 1665–1800. *Journal of the Society for the Bibliography of Natural History* 3(1):56–60.

McAtee, W.L. 1957. North American birds of Mark Catesby and Eleazar Albin. *Journal of the Society for the Bibliography of Natural History* 3(4):177–194.

McAtee, W.L. 1963. The North American birds of Thomas Pennant. *Journal of the Society for the Bibliography of Natural History* 4(2):100–124.

Murphy, M.T. 1996. Eastern Kingbird (*Tyrannus tyrannus*). In The Birds of North America, No. 253, A. Poole and F. Gill (Editors). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington D.C.

Pluche, N.A. 1750. *Spectacle de la Nature or Nature Display'd* (seventh edition, revised and corrected). Translated from the original French by S. Humphreys. Printed for R. Francklin, et al., London, UK. 323 pp. Available at: https://books.google.com/books/about/Spectacle_de_la_Nature_Or_Nature_Display.html?id=z3E-AAAAYAAJ. Accessed 28 July 2020.

Rohwer, S., K.A. Hobson, and V.G. Rohwer. 2009. Migratory double breeding in Neotropical migrant birds. *Proceedings of the National Academy of Sciences* 106(45):19050–19055.

Stewart, R.E., and C.S. Robbins. 1958. *Birds of Maryland and the District of Columbia*. North American Fauna, Number 62, United States Department of the Interior, Fish and Wildlife Service. United States Government Printing Office, Washington, DC. 401 pp.

Tilghman, O. (Compiler). 1915. *History of Talbot County Maryland 1661–1861*, Volume 1. Williams & Wilkins Company, Baltimore, MD. 649 pp. Available at: https://books.google.com/books?id=uAc1AAAAIAAJ&pg=PP13&source=gbs_selected_pages&cad=2#v=onepage&q&f=false. Accessed 28 July 2020.

Trotter, S. 1909. An inquiry into the history of the current English names of North American land birds. *The Auk* 26(4):346–363.

Vieillot, L.P. 1807. *Histoire Naturelle des Oiseaux de l'Amérique Septentrionale*, tome premier. (*Natural History of the Birds of North America*, volume one.) Chez Desray, Paris, France. 99 pp.

Wheeler, J.T. 1942. Reading interests of Maryland planters and merchants, 1700–1776. *Maryland Historical Magazine* 37(1):26–41. Available at: https://msa.maryland.gov/megafile/msa/speccol/sc5800/sc5881/000001/000000/000145/pdf/msa_sc_5881_1_145.pdf. Accessed 28 July 2020.

Wroth, L.C. 1911. A Maryland merchant and his friends in 1750. *Maryland Historical Magazine* 6(3):213–240. Available at: https://msa.maryland.gov/megafile/msa/speccol/sc5800/sc5881/000001/000000/000023/pdf/msa_sc_5881_1_23.pdf. Accessed 28 July 2020.

Maryland Birdlife 70(2):23–24

Avian Predation on Brood X 17-year Periodical Cicadas, *Magicicada* Davis spp. (Hemiptera: Cicadidae), in Elkton, Cecil County, Maryland in 2004

Marcia R. Watson

14207 Lakerun Court, Bowie, Maryland 20720-4861;
marshwren50@comcast.net

In May and June 2021, the Mid-Atlantic and the Midwest Regions experienced the massive emergence of Brood X 17-year periodical cicadas, *Magicicada* Davis spp. (Hemiptera: Cicadidae). In this brief note, I document avian predation during the preceding Brood X emergence that occurred in late May and early June 2004.

Figure 1. Mating by Brood X 17-year periodical cicadas, *Magicicada septendecim* (Linnaeus) (Hemiptera: Cicadidae). Photographed by Michael J. Raupp; Howard County, Maryland; 22 May 2004.

In 2004, I lived at 300 Suburban Drive in the Chapel Run subdivision of Elkton, Cecil County, Maryland, near the Maryland-Delaware line. The property backed up to shrubby woods with some mature deciduous trees. To the immediate east of the house was an open lot destined to be a forest restoration area but in 2004, it had not yet been planted and was an open field with native grasses and large expanses of mud. Beyond that was a stormwater management pond whose water level fluctuated considerably. The pond frequently attracted herons, egrets, and shorebirds. Beyond the pond was a shrubby power line cut with tall metal power line towers.

During the May 2004 massive emergence of Brood X periodical cicadas, many species of birds were observed at and around my house preying on the cicadas. Most impressive were six species of herons and egrets. These included:

- Great Blue Heron, *Ardea herodias*;
- Great Egret, *Ardea alba*;
- Little Blue Heron, *Egretta caerulea*;
- Cattle Egret, *Bubulcus ibis*;
- Green Heron, *Butorides virescens*; and
- Black-crowned Night-Heron, *Nycticorax nycticorax*.

These waders would line up on my deck every morning to prey on the abundant cicadas that were present. One morning, I counted 23 herons and egrets on the deck and its railings!

I also observed six non-heron/egret species at my house preying on periodical cicadas. These included:

- Yellow-billed Cuckoo, *Coccyzus americanus*;
- Black-billed Cuckoo, *Coccyzus erythropthalmus*;
- American Kestrel, *Falco sparverius*;
- Scarlet Tanager, *Piranga olivacea*;
- Blue Grosbeak, *Passerina caerulea*; and
- Indigo Bunting, *Passerina cyanea*.

All but the American Kestrel were partial to a large black walnut, *Juglans nigra* L. (Juglandaceae), that overlooked the corner of my yard. They would systematically work the trunk and branches devouring cicadas. The American Kestrel hung out in the nearby power line cut and hawked cicadas from the air.

Maryland Birdlife 70(2):24

2020 Maryland May Count: Corrigendum

The results of the 2020 Maryland May Count that were published in the spring 2021 issue of *Maryland Birdlife* contained incorrect listings for Common Grackle and Boat-tailed Grackle. Table 2 (Western Maryland observed species) incorrectly showed 418 Common Grackles and 5 Boat-tailed Grackles for Anne Arundel County. All of these grackles should have been tallied as Common Grackles. This would result in 423 Common Grackles and no Boat-tailed Grackles for Anne Arundel County. The corrected line entries for Figure 2 would be as shown below.

Species	GA	AL	WA	FR	MO	CA	HO	BA	HA	CE	PG	AA
Common Grackle	189	84	168	293	565	185	234	459	64	8	434	423
Boat-tailed Grackle												

LITERATURE CITED

Veek, M.E. 2021. 2020 Maryland May Count. *Maryland Birdlife* 70(1):68–80.

Maryland Birdlife 70(2):25–40

Quantifying the Recovery of the Active Nesting Bald Eagle (*Haliaeetus leucocephalus*) Population in New Jersey

Megan A. McKay[1], Baoling Ma[1], and Lisa E. Marano[2,*]

[1]*Millersville University of Pennsylvania, 40 Dilworth Road, Millersville, Pennsylvania 17551*
[2]*West Chester University of Pennsylvania, 700 S. High Street, West Chester, Pennsylvania 19383*
**Corresponding author: LMarano@wcupa.edu*

Abstract: Several mathematical models are built to analyze the growth and productivity rate of the New Jersey nesting Bald Eagle (*Haliaeetus leucocephalus*) population. The report works to quantify and project the restoration efforts of the Bald Eagle population from the deleterious effects of long-term use of agricultural pesticides, including dichlorodiphenyltrichloroethane (DDT). The logistic model and stage-structured population model are used to calculate the Bald Eagle population's carrying capacity and asymptotic growth rate; they are also used to predict the populations of active pairs, successful pairs, and young produced. Supported by over thirty years of data collected by the New Jersey Department of Environmental Protection Division of Fish and Wildlife, the results show that the active nesting Bald Eagle population in New Jersey, down to a single known nesting pair in 1970, increases with an intrinsic growth rate of 15.56% per year and has a carrying capacity of 341 active nesting pairs. According to this model, the rate of increase in the active nesting Bald Eagle population began to slow after 2017, and the population will reach its carrying capacity by the year 2059. These results will depend on the future impact of human interaction, encroachment, bioaccumulation of agricultural pesticides, and other environmental contaminants.

Cuantificación de la Recuperación del *Haliaeetus leucocephalus* Anidada Activa de la Población de New Jersey

Resumen: Algunos modelos matemáticos han sido creados para analizar la tasa de crecimiento y productividad de la población del *Haliaeetus leucocephalus* en New Jersey. El informe trabaja en cuantificar y proyectar los esfuerzos de restauración por los perjudiciales efectos a largo plazo por el uso the pesticidas en la agricultura de la población del águila, incluyendo

diclorodifeniltricloroetano (DDT). El modelo logístico y el modelo estructurado por etapas son usados para calcular la capacidad de carga y la velocidad de crecimiento asintótico de la población del águila; ellos también lo han usado para predecir las parejas activas en la población, parejas exitosa, y joven producido. Soportado a través the 30 años de datos colectados en el Departamento de División de Protección Ambiental de Pesca y Vida Silvestre de New Jersey, los resultado muestran nidos activos del águila en New Jersey, hasta una única pareja anidadora conocida en 1970, aumenta con una tasa de crecimiento intrínseca del 15.56% anual y tiene la capacidad de carga de 341 nidos de parejas activas. De acuerdo con este modelo, la tasa de aumento en la población activa de anidación del águila comenzó a desacelerarse después de 2017, y la población alcanzará su capacidad de carga para el año 2059. Los resultados dependerán del futuro impacto de la interacción humana, la invasión, bioacumulación de plaguicidas agrícolas y otros contaminantes ambientales.

Keywords: Bald Eagle, *Haliaeetus leucocephalus*, New Jersey, population carrying capacity, population recovery, logistic model, stage-structured population model.

The Bald Eagle (*Haliaeetus leucocephalus*) is a North American large raptor, easily distinguished by its prominent white head feathers when in adult plumage. This bird of prey has a long history with the Native Americans, and more recently is associated as the national bird of the United States of America. The Bald Eagle has experienced considerable fluctuations in its population, from sizable populations that led to the establishment of a bounty in Alaska in 1917, to the dramatic decrease that resulted in the enactment of the Bald Eagle Protection Act in 1940, and to the species being listed as Endangered in 1966 (Buehler 2020, Millar 2002).

Known as the Garden State, New Jersey enjoys a rich farming history, however, this history comes at a price. Agricultural pesticides, such as calcium arsenate for white potatoes and lead arsenate for apple and peach orchards applied at a rate of several pounds per acre, were used through 1967. Dichlorodiphenyltrichloroethane (DDT), first used for mosquito control, became more widely used on food crops (Murphy and Aucott 1998, Historic Pesticide Contamination Task Force 1999). Because of these pest control measures, the Bald Eagle, which skillfully inhabited the state prior to the 1960s, experienced steep population declines. So severe was the decline that the population decreased to a sole active pair by 1970 nesting in Bear Swamp (Figures 1A and 1B), a region providing tall trees adjacent to water, typical of a Bald Eagle's chosen breeding site (Smith and Clark 2020). In 1972, DDT, determined to cause thinning of avian eggshells, was banned by The United States

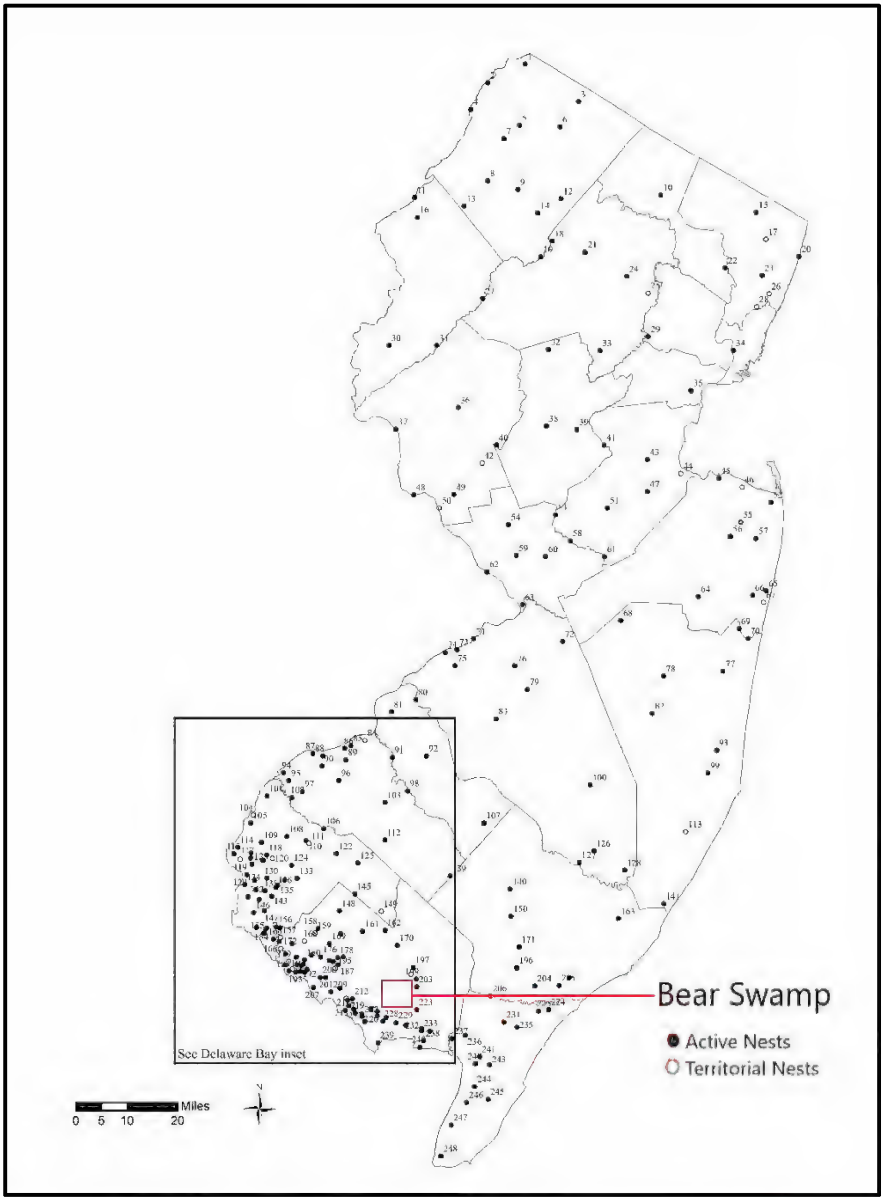

Figure 1A. Nest distribution in New Jersey showing locations of known Bald Eagle (*Haliaeetus leucocephalus*) nests in 2020. Adapted from Smith and Clark (2020).

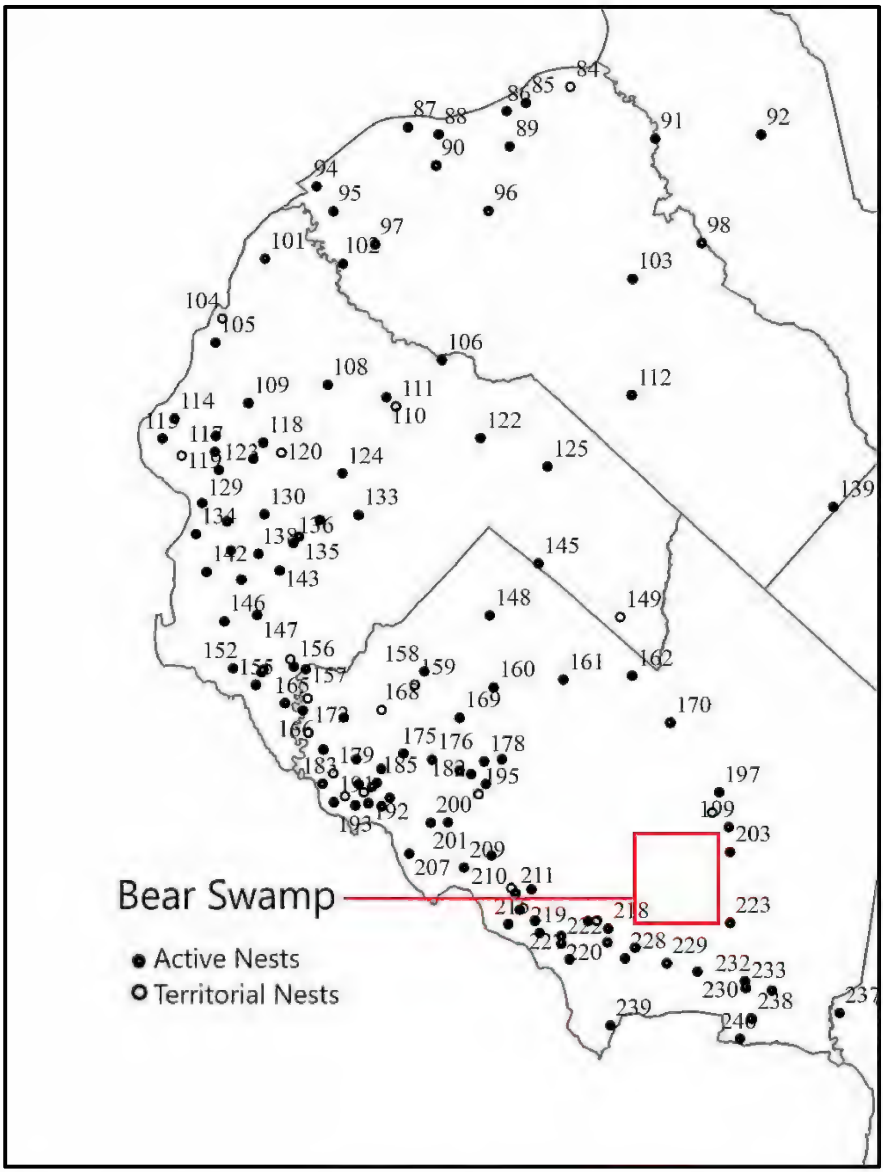

Figure 1B. Delaware Bay inset showing New Jersey locations of known Bald Eagle nests in 2020 and the location of Bear Swamp. Adapted from Smith and Clark (2020).

Environmental Protection Agency (EPA) (National Pesticide Information Center 1999). According to the New Jersey Division of Fish and Wildlife (2004), the state enacted the New Jersey Endangered Species Conservation Act of 1973, which established laws to protect, monitor, and restore wildlife. Two weeks later, the federal program was enacted, and the Endangered Species Act was passed by Congress and signed by President Richard M. Nixon in 1973 (New Jersey Division of Fish and Wildlife 2004).

The New Jersey Endangered Species Conservation Act of 1973 allowed the New Jersey Division of Fish and Wildlife to establish the Endangered and Nongame Species Program (ENSP) whose charge is to conserve New Jersey's biological diversity (New Jersey Division of Fish and Wildlife 2004). When the lone nesting pair of Bald Eagles, contaminated with residual DDT, failed to produce offspring for six successive years, the ENSP began a fostering program in 1982 to kickstart recovery efforts. This project comprised of removing the eggs laid by the Bear Swamp pair in 1983, replacing them with plaster substitutes, and hatching them in captivity at a Maryland wildlife research center, before reintroducing them to the nest as two-week old eaglets. This artificial hatching process continued each year until 1988. The ENSP was able to successfully fledge 11 out of the 12 chicks they fostered in the lone Bear Swamp nest (Niles et al. 1991). The following year, a new adult female, uncontaminated by DDT, began nesting and could hatch eggs without human help, marking the end of the hacking project. To augment the production from this original nest, 56 eagles, taken from nests in Manitoba, Canada, were released in this region of New Jersey beginning in 1982, until 1990. Another four birds were released along the Atlantic Coast in 1989 (Niles et al. 1991). In 1995, the project's overall goal of 10 new nests was surpassed, and in 2020, 220 active pairs were recorded in the state (Smith and Clark 2020). Bear Swamp, with its favorable habitat, still attracts Bald Eagles, as seen by the density of nests observed near this region today (Figures 1A and 1B) (Smith and Clark 2020). Because of these extreme conservation measures, the Bald Eagle in New Jersey is now listed as endangered during breeding season, while it is listed as only threatened during non-breeding season (New Jersey Division of Fish and Wildlife 2015). Due to similar conservation efforts across the country, the Bald Eagle was removed from the Federal Endangered Species list in 2007 and is now considered one of the greatest recovery success stories (Heisman 2018).

The purpose of this study is to analyze and fit mathematical population models for the active nesting Bald Eagle population, relying on the observational data from 1990 through 2020. We also analyze how the hacking project has affected the population. This tremendous restoration, supported by over 30 years of data, provides a comprehensive look at the New Jersey active nesting Bald Eagle population along with an understanding of the population dynamics of these large birds, and the long-term effects of the hacking projects. The sizeable

amount of data obtained distinguishes this study from others because of historical "constraints of monitoring large areas over many years" (Mougeot et al. 2013).

METHODS

Data Collection. Throughout this report, several terms are used. For clarity, note that: (1) a pair of nesting Bald Eagles is "active" if the nest contains at least one egg; (2) a pair is "successful" if it fledges at least one eaglet; and (3) "young produced" simply refers to the total young fledged in a year. The data used in this report were obtained from the New Jersey Department of Environmental Protection, Division of Fish and Wildlife and are delineated by year in Figure 2. Data collection methods relied on observations gathered mainly by volunteers (Smith and Clark 2020). Observations of each known nest began in January of each year and lasted through fledging, or late July. Volunteers observed through binoculars at approximately 305 m (1,000 ft), recorded all data (e.g., number of birds and nesting behavior), and included any other observations relevant to nesting status. Volunteers also reported sightings of other Bald Eagles or other clues that might lead to a new nest location. All observational data were presented to the ENSP and Conserve Wildlife Foundation (CWF) biologists and

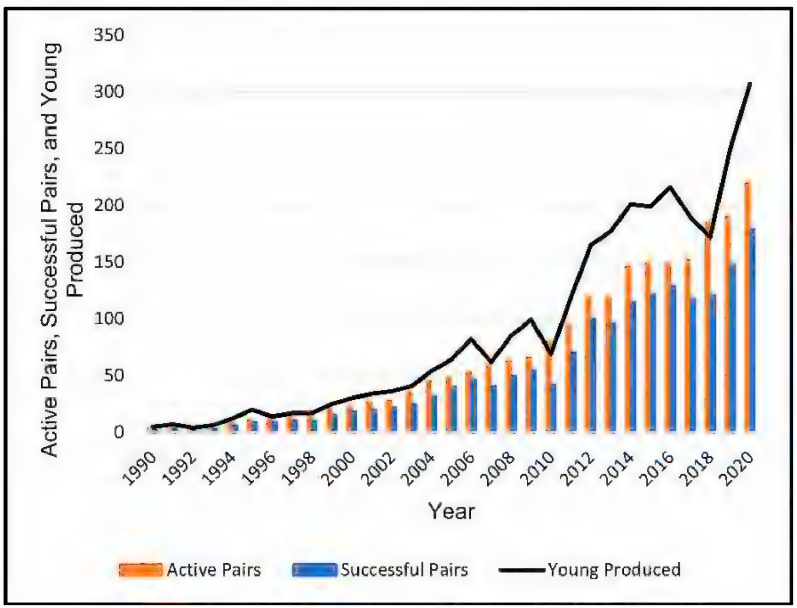

Figure 2. Observational data for active pairs, successful pairs, and young produced.

were then recorded following U.S. Fish and Wildlife Service's monitoring plan. Every potential new discovery was investigated by ENSP staff and volunteers, and an aerial survey may have taken place when evidence suggested a nest.

While data were available dating back until 1983, to best capture the natural growth of the birds' population after the completion of human interference, we limited our analysis to the years 1990 through 2020, after the hacking projects were completed.

Mathematical Models. The logistic population model was adopted to capture the growth rate of nesting pairs, assuming that the growth rate depends on the size of the population. A stage-structured population model was built to study the demographic features of the nesting Bald Eagle population. This Lefkovitch matrix population model links the per capita survival, maturation, and reproduction rates of the female eagles to the demographic dynamics of the population. The life cycle of the Bald Eagle, as shown in Figure 3, is divided into three stages for analysis, following the Cornell Lab Report (Buehler 2020). Birds that fall into the first stage (< 1 year of age) are referred to as eaglets, which have successfully left the nest, but are still gaining foraging experience. Although nest departure occurs at 8–14 weeks, fledglings may be fed by adults up to 6 weeks after leaving the nest. Similar to the survival pattern of other raptors, Bald Eagles have lower first-year survival (Buehler 2020). The second stage birds (ages 1–4 years of age) are called subadults. These birds are classified by their increased independence and their lack of the defining white plumage of an adult eagle (McCollough 1989). It is assumed that subadults refrain from breeding. The third stage (≥ 5 years of age) is characterized by reproductive activity and the well-known white definition on their heads. It is assumed that most adult eagles remain sexually active, and therefore remain in stage three, until the end of their life.

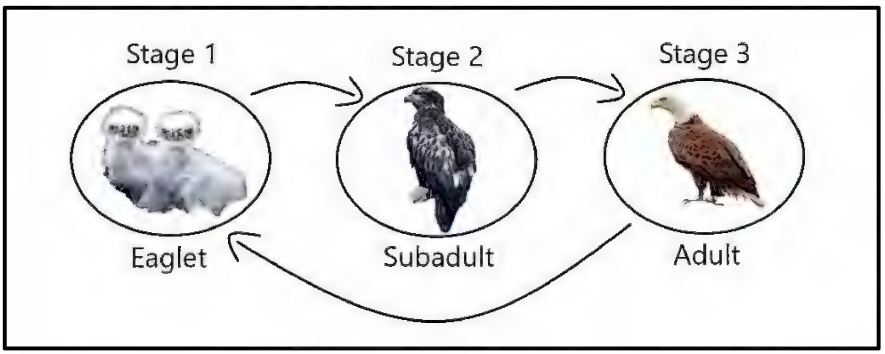

Figure 3. Life cycle of Bald Eagles. Eaglets (U.S. Fish and Wildlife 2021), subadult (Liguori and Liguori 2003), adult (Ragin 2020).

The stage-structured population model is implemented using the following system of equations:

$$N_1(t+1) = bN_3(t),$$

$$N_2(t+1) = s_1N_1(t) + (1-\gamma)s_2N_2(t), \text{ and}$$

$$N_3(t+1) = \gamma s_2N_2(t) + s_3N_3(t).$$

Here, $N_i(t)$ refers to the number of active pairs in stage i at year t, for $i = 1, 2, 3$. The individual survival rate of the eaglets, the subadult eagles, and the adult eagles is represented by s_1, s_2, and s_3, respectively. The per capita birth rate of female eagles is denoted by b, and the proportion of subadult eagles that mature into the adult stage is given by γ.

Based on the vital rates assumptions, the least squares method is used for the logistic model to fit the data from 1990 through 2020. The carrying capacity, the population's growth rate, and the time that the growth rate of the population began to slow down were approximated by using the logistic growth model and fitting it with the dataset using the least squares fitting in the Solver capability in Excel. Least squares fitting is used for the stage-structured population model in MATLAB to calculate the stable stage population distribution and to perform the sensitivity analysis.

RESULTS

Logistic model. The fitting of the logistic model to active pairs data is shown in Figure 4, while the prediction of the active pairs is seen in Figure 5. The predicted population of active pairs is 221 pairs in 2021, 233 pairs in 2022, and 244 pairs in 2023. The carrying capacity for active pairs of the Bald Eagle population in New Jersey is 341 pairs, and it will be reached in the year 2059. Moreover, the population realized a slowdown in growth after 2017. The intrinsic growth rate associated with the logistic model producing these results is 15.56% for active pairs. Similar results are obtained for successful nesting pairs and young produced. Successful pairs grow at an intrinsic rate of 16.21% per year, with a carrying capacity of 252 pairs. They reach carrying capacity in year 2059 and the growth rate slowed down after year 2017. The growth rate of the young produced was 16.37% per year, with a carrying capacity of 397 eaglets per year. It will approach the carrying capacity around 2053, and the growth rate realized a slowdown after 2016.

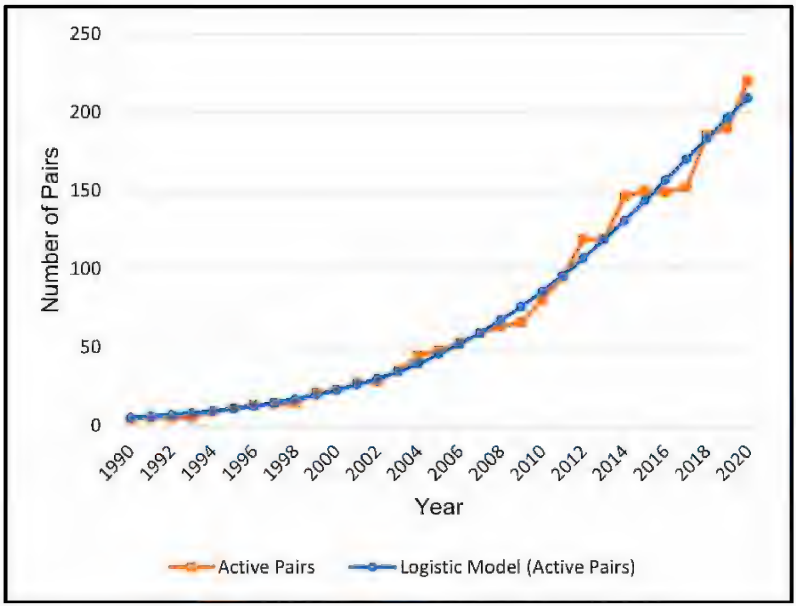

Figure 4. Data fitting using the logistic model.

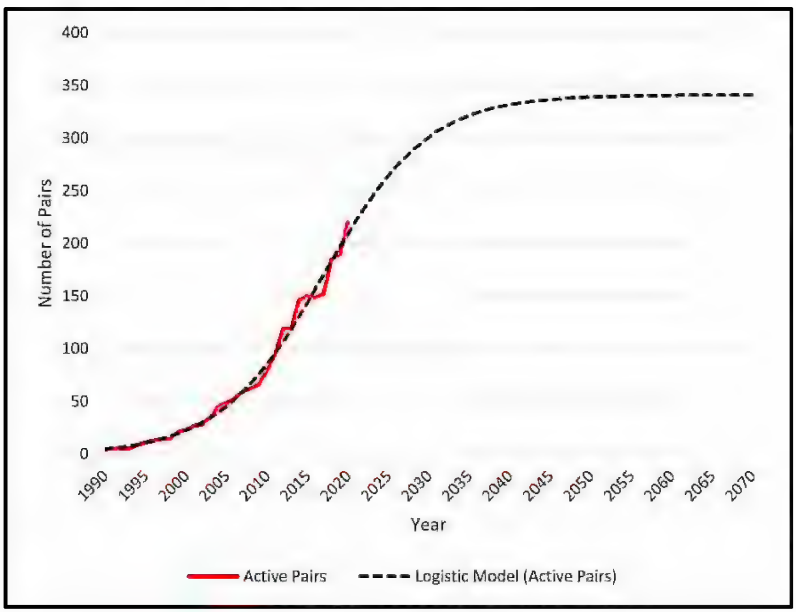

Figure 5. Prediction of active nesting pairs using the best fitted logistic model.

Stage-structured population model. The fitting of active pairs to the stage-structured population model is shown in Figure 6. The asymptotic growth rate is calculated to be $\lambda = 1.1088$, meaning the nesting Bald Eagle population grows on average by approximately 10.88% per year (Caswell 2009). Based on the calculated population stable stage distribution, we see that when the population reaches a stable state, about 26.34% of the population will be eaglets, 32.83% will be subadults, and 40.83% will be adult eagles. The value of the growth rate, λ, depends on the birth rate, the maturation rate, and the survival rate for each stage of development: eaglets, subadult eagles, and adult eagles. Sensitivity analysis shows that λ is most sensitive to the survival rate of the adult eagle, but it is least sensitive to changes in the birth rate (Caswell 2009). The analysis also demonstrates that the subadult maturity rate has a slight negative impact on the population's life expectancy. That is to say, if the rate in which the population matures from subadult to adult population quickens, this will have an overall negative impact on the average life expectancy of the New Jersey Bald Eagle. There is evidence that animals can mature early under certain conditions – environmental toxicants, temperature rise, etc. (Pietsch et al. 2008, Székely et al. 2017). As a result, they may mature to a smaller size or may not be able to properly care for or feed their young due to lack of experience, all impacting life expectancy (Székely et al. 2017).

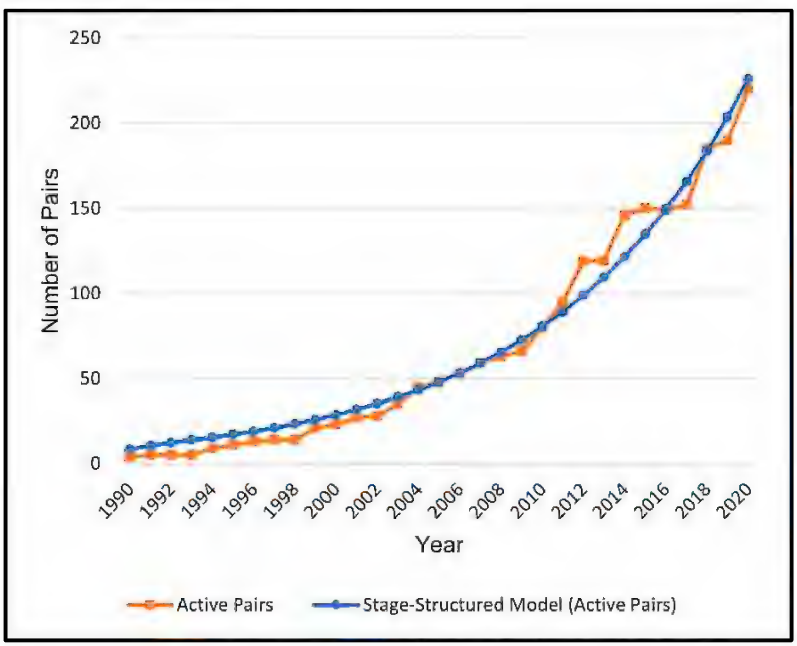

Figure 6. Data fitting using the stage-structured population model.

DISCUSSION

Recovery efforts for the Bald Eagle population in New Jersey tell a celebrated story. However, as with any population fitted by a logistic model, the Bald Eagle population's net per capacity growth rate will begin to decrease more quickly as the population size approaches a maximum level, i.e., its carrying capacity. This slowdown in the population growth is due to limitations which are both density-dependent and density-independent (Edwards and Edwards 2011). Threats to habitat due to predation (density-dependent) and sensitivity to environmental toxicants exposure (density-independent) have contributed to the slowdown of the growth rate of the Bald Eagle population in New Jersey. Moreover, this slowdown is being seen in other regions of the country.

The most recent New Jersey Bald Eagle Report produced by the ENSP illustrates that a majority of the active nesting pairs reside in southern New Jersey within 20 km (12 mi) of the Delaware River and Bay (Figures 1A and 1B) (Smith and Clark 2020). Since loss of habitat and disturbance pose the greatest threats to Bald Eagle nesting, understanding human population within this region is relevant (Smith and Clark 2020). Within the watershed of the Delaware Bay Estuary, an estimated 1.6 million people reside. To illustrate how this region has changed in recent years, Gloucester County, New Jersey, which lies within its borders, realized a 12% growth in population between the 2000 and 2010 census reports (Kauffman 2011). The ENSP, which annually prepares the New Jersey Bald Eagle Report, the source of the data for this project, also catalogs injured or dead eagles recovered in the state each year with details of the injury sustained to each bird and necropsy when applicable. When a source of injury for either subadult or adult can be determined, most often it can be placed into one of two categories: (1) an injury from another Bald Eagle or animal, or (2) a man-made cause, such as electrocution, car or train crash, fence or net entanglement, or lead poisoning. This is further evidence of the existence of a carrying capacity as the Bald Eagles are competing for space with each other and other animals, and human intrusion is proving dangerous already.

While residual effects of DDT may be waning, other environmental toxicants may be present in New Jersey, especially within the Delaware River and Basin area. Much of this region is either currently or historically farmland. In a 1998 New Jersey Department of Environmental Protection report, of 18 current and former agricultural sites tested for impact of historic pesticide use, arsenic was detected on every site. Moreover, it was detected at cleanup level in 38% of the 450+ samples taken (Historic Pesticide Contamination Task Force 1999). The Delaware River Port Complex, serving oil, chemical, and other industries, is the largest freshwater port in the world with docks in Delaware, Pennsylvania, and New Jersey, and lies just upstream from the Delaware Bay (Delaware River Basin Commission 2021). Polychlorinated biphenyl (PCB) used in industrial

processes, past and present, along these waters have resulted in human fish consumption advisories ranging from "do not eat" to "safe to eat three times per year" (Tambini et al. 2020). Unfortunately, Bald Eagles, being opportunistic and tempted by the availability of White Perch (*Morone americana*) and Channel Catfish (*Ictalurus punctatus*) in the Delaware Estuary, cannot heed these same advisories. Clark et al. (1998) measured PCB levels in Bald Egg eggs where reproductive failures occurred. While PCB levels were high in all eggs tested, the study was too small to draw conclusions. To illustrate the PCB load on this part of the region, the Delaware River Basin Commission (2019) instituted PCB remediation plans which helped to reduce PCB levels from the top ten sources of PCB discharges along the river by 76% between 2005 and 2016 from over 30,000 mg (1.1 oz) daily to just under 8,000 mg (0.3 oz) daily. Given that Bald Eagles enjoy long lives and that many live in this region year-round, bioaccumulation of these toxicants, both arsenic and PCBs, may have lasting effects on the older birds' ability to successfully reproduce (Clark et al. 1998). Studies on the Lake Michigan shore of Green Bay, Wisconsin, concluded that PCBs and the possibility of breeding at a younger than average age may have led to low reproductive rates (Dykstra et al. 2001). The latter theory concurs with our stage-structured population model analysis. An analysis of the population of Bald Eagles residing in just the Delaware Bay area would aid in gaining a better understanding of the health of the region, as there is evidence that environmental toxicants may be localized to this region (Clark et al. 2001).

Other regions of the country are experiencing phenomena similar to that of the growth rates of the New Jersey active nesting population. A recent report on the recovery efforts in Louisiana suggested that the increase in the nesting population may be slowing in the southeastern portion of their state, as well (Smith et al. 2016). The Wisconsin Department of Natural Resources completes aerial surveys of Bald Eagle nests annually. Our analysis of occupied nests based on data published from their 2019 report confirms a logistic growth model (intrinsic growth rate of 9.08% and carrying capacity of 2,199) in this region, as well (Wisconsin Department of Natural Resources 2019). Our calculated asymptotic growth rate of 10.9% fits nicely with the predictions made by Buehler (2020), where the eagle population in Chesapeake Bay, a nearby region, was predicted to grow by 5.8–16.6% per year.

In a steady state, the U.S. Fish and Wildlife Service (2016) estimated that the percentage of adult Bald Eagles (4 years old or over) in the United States excluding the Southwest will be 43%, and in the Southwest, the percentage of adults will be 40%. These estimates were obtained using Lefkovitch population models with a five-stage system. Their results for the proportion of adult populations align with the three-stage-structure population model presented here, which predicts 40.83% of the New Jersey Bald Eagles will be adults when steady-state population is achieved.

ACKNOWLEDGMENTS

The morning this paper was submitted for review, an event that is becoming not so rare occurred; a Bald Eagle flew directly over the New Jersey home of the corresponding author. This simple act captures the recovery story of this majestic bird. We thank all those whose work helps to protect and promote the Bald Eagle in the State of New Jersey and beyond. In particular, we thank those who assist the New Jersey Division of Fish and Wildlife with data collection, location and monitorship of the Bald Eagles, their nests, and the habitat within the state. This includes countless volunteers and biologists from across the state. We especially express our gratitude towards Ms. Larissa Smith and Dr. Kathleen E. Clark, biologists with the New Jersey Endangered and Nongame Species Program, as well as Dr. Lawrence J. Niles, biologist with the Conserve Wildlife Foundation of New Jersey, who were instrumental in supplying our team with decades of Bald Eagle data and guidance. We are grateful to *Maryland Birdlife* editor Eugene J. Scarpulla for his thoughtful guidance throughout the submission and editing process and we thank the two anonymous reviewers for their wise suggestions and comments; the contributions of all three made this a much better piece. The corresponding author would like to thank three neighborhood high school students, Evan Kidd, Joshua Mathew, and A. J. Negro, who helped with preliminary data entry. We recognize and thank the people of New Jersey; local, county, and state agencies and parks services; and utility companies, who all share their space with the Bald Eagle and for managing and protecting our land so that the Bald Eagle may continue to thrive. Without everyone's efforts and cooperation, we have no recovery story to tell.

LITERATURE CITED

Buehler, D.A. 2020. Bald Eagle (*Haliaeetus leucocephalus*), version 1.0 (text last updated 1 January 2000). In: Birds of the World (A.F. Poole and F.B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. Available at: https://doi.org/10.2173/bow.baleag.01.

Caswell, H. 2009. Stage, age and individual stochasticity in demography. *Oikos* 118(12):1763–1782. Available at: https://doi.org/10.1111/j.1600-0706.2009.17620.x.

Clark, K.E., L.J. Niles, and W. Stansley. 1998. Environmental contaminants associated with reproductive failure in Bald Eagle (*Haliaeetus leucocephalus*) eggs in New Jersey. *Bulletin of Environmental Contamination and Toxicology* 61(2):247–254.

Clark, K.E., W. Stansley, and L.J. Niles. 2001. Changes in contaminant levels in New Jersey Osprey eggs and prey, 1989 to 1998. *Archives of Environmental Contamination and Toxicology* 40(2):277–284.

Delaware River Basin Commission. 2019. Water Quality Programs of the Delaware River Basin Commission. West Trenton, NJ, USA. 20 pp. Available at: https://www.nj.gov/drbc/library/documents/WQBooklet_final_print.pdf.

Delaware River Basin Commission. 2021. Basin Information (last modified: 11 June 2021). West Trenton, NJ, USA. Available at: https://www.state.nj.us/drbc/basin/.

Dykstra, C.R., M.W. Meyer, K.L. Stromborg, D.K. Warnke, W.W. Bowerman, IV, and D.A. Best. 2001. Association of low reproductive rates and high contaminant levels in Bald Eagles on Green Bay, Lake Michigan. *Journal of Great Lakes Research* 27(2):239–251.

Edwards, W.J., and C.T. Edwards. 2011. Population limiting factors. *Nature Education Knowledge* 3(10):1. Available at: https://www.nature.com/scitable/knowledge/library/population-limiting-factors-17059572/.

Heisman, R. 2018. Beacon of Hope. *Bird Conservation* (spring issue):12–16.

Historic Pesticide Contamination Task Force. 1999. Findings and Recommendations for the Remediation of Historic Pesticide Contamination - Final Report. New Jersey Department of Environmental Protection, Trenton, NJ, USA. 43 pp. Available at: https://www.nj.gov/dep/special/hpctf/final/hpctf99.pdf.

Kauffman, G.J. 2011. Economic Value of the Delaware Estuary Watershed: Comprehensive Report. Institute for Public Administration, School of Public Policy & Administration, College of Arts & Sciences, University of Delaware, Newark, DE, USA. 67 pp. Available at: http://udspace.udel.edu/bitstream/handle/19716/9773/DelEstuaryValueReport.pdf.

Liguori, J., and S. Liguori. 2003. Immature (Sub-adult I) Bald Eagle, Utah, January (photo). In: D.A. Buehler. 2020. Bald Eagle (*Haliaeetus leucocephalus*), version 1.0 (text last updated 1 January 2000). In: Birds of the World (A.F. Poole and F.B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. Available at: https://birdsoftheworld.org/bow/species/baleag/cur/appearance.

McCollough, M.A. 1989. Molting sequence and aging of Bald Eagles. *The Wilson Bulletin* 101(1):1–10.

Millar, J.G. 2002. The protection of eagles and the Bald and Golden Eagle Protection Act. *The Journal of Raptor Research* 36(1 Supplement):29–31.

Mougeot, F., J. Gerrard, E. Dzus, B. Arroyo, P.N. Gerrard, C. Dzus, and G. Bortolotti. 2013. Population trends and reproduction of Bald Eagles at Besnard Lake, Saskatchewan, Canada 1968–2012. *The Journal of Raptor Research* 47(2):96–107.

Murphy, E.A. and M. Aucott. 1998. An assessment of the amounts of arsenical pesticides used historically in a geographical area. *Science of The Total Environment* 218(2–3):89–101.

National Pesticide Information Center. 1999. DDT (General Fact Sheet). Oregon State University, Corvallis, OR, USA. Available at: http://npic.orst.edu/factsheets/ddtgen.pdf.

New Jersey Division of Fish and Wildlife. 2004. Endangered Species Conservation Act, 30 Years of Protection (last updated 6 October 2004) New Jersey Department of Environmental Protection. Trenton, NJ. Available at: https://www.nj.gov/dep/fgw/ensp/somhome.htm.

New Jersey Division of Fish and Wildlife. 2015. Wildlife Notes: Bald Eagle (*Haliaeetus leucocephalus*). New Jersey Department of Environmental Protection, Endangered and Nongame Species Program. Trenton, NJ. 2 pp. Available at: https://www.nj.gov/dep/fgw/ensp/pdf/end-thrtened/baldeagle.pdf.

Niles, L., K. Clark, and D. Ely. 1991. Status of Bald Eagle nesting in New Jersey. *Records of NJ Birds* 17(1):2–5.

Pietsch, C., S. Oates, J. Hess, and W. Berry. 2008. Effects of early maturation on growth, fertility and testosterone levels in broiler breeder males. *International Journal of Poultry Science* 7(3):207–210. Available at: https://doi.org/10.3923/ijps.2008 .207.210.

Ragin, D. 2020. Adult Bald Eagle (cover photo): "Oran," band E/17, at Port Mahon, DE, on 3/24/2020. In: L. Smith and K.E. Clark. 2020. New Jersey Bald Eagle Project, 2020. New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program. Trenton, NJ. 28 pp. Available at: https://www.njfishandwildlife.com/ensp/pdf/eglrpt20.pdf.

Smith, L., and K.E. Clark. 2020. New Jersey Bald Eagle Project, 2020. New Jersey Department of Environmental Protection, Division of Fish and

Wildlife, Endangered and Nongame Species Program. Trenton, NJ. 28 pp. Available at: https://www.njfishandwildlife.com/ensp/pdf/eglrpt20.pdf.

Smith, N.R., T.J. Hess, Jr., and A.D. Afton. 2016. History and nesting population of Bald Eagles in Louisiana. *Southeastern Naturalist* 15(1):12–25.

Székely, D., M. Denoël, P. Székely, and D. Cogălniceanu. 2017. Pond drying cues and their effects on growth and metamorphosis in a fast developing amphibian. *Journal of Zoology* 303(2):129–135. Available at: https://doi.org/10.1111/ jzo.12468.

Tambini, S., J. Yagecic, and A. Shallcross. 2020. A Fishable, Swimmable (and Drinkable) Delaware River Estuary. 8th Annual Delaware River Watershed Forum, September 14–17, 2020. Coalition for the Delaware River Watershed. Trenton, NJ. Available at: https://www.state.nj.us/drbc/library/documents/DRBC_FishableSwimmableDrinkable_DelawareEstuary_CDRWforum091720.pdf.

U.S. Fish and Wildlife. 2021. NH PBS (New Hampshire PBS): NatureWorks: Bald Eagle – *Haliaeetus leucocephalus*: two eaglets (photo). Available at: https://nhpbs.org/natureworks/baldeagle.htm.

U.S. Fish and Wildlife Service. 2016. Bald and Golden Eagles: Population demographics and estimation of sustainable take in the United States, 2016 Update. Division of Migratory Bird Management, Washington, DC, USA. 101 pp. Available at: https://www.fws.gov/migratorybirds/pdf/management/EagleRuleRevisions-StatusReport.pdf.

Wisconsin Department of Natural Resources. 2019. Wisconsin Bald Eagle and Osprey Nest Surveys 2019. Madison, WI, USA. 9 pp. Available at: https://dnr.wisconsin.gov/sites/default/files/topic/WildlifeHabitat/2019EagleOspreySurveys.pdf.

Maryland Birdlife 70(2):41–70

Nesting of the Peregrine Falcon (*Falco peregrinus*) in Maryland Since Reintroduction of the Species

Glenn D. Therres[1,*], Craig A. Koppie[2] and Matthew T. Olear[3]

[1]*Maryland Department of Natural Resources, Wildlife and Heritage Service, 580 Taylor Avenue, Annapolis, Maryland 21401*
[2]*U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, 177 Admiral Cochrane Drive, Annapolis, Maryland 21401*
[3]*8308 Sweet Cherry Lane, Laurel, Maryland 20723*
**Corresponding author: glenn.therres@gmail.com*

Abstract: The first nesting of Peregrine Falcons (*Falco peregrinus*) in Maryland after the species' reintroduction occurred in 1983 at two locations. Since then, Peregrine Falcons have nested at numerous man-made structures on the Coastal Plain and Piedmont physiographic regions of the state. Forty nest sites were known to be used by Peregrines during a 38-year period. Most were located on structures with platforms or other flat surfaces suitable for nesting and included seven specially designed marsh towers, 13 bridges, four buildings, and 13 other structures. The site that produced the greatest number of young in Maryland was in downtown Baltimore where 91 young were produced through 2020. The Chesapeake Bay Bridge was the most productive of the bridge sites used in Maryland with at least 73 young produced over a 38-year span. The first known nesting at a natural cliff, since the reestablishment of the breeding population, occurred at a historic eyrie in Western Maryland in 2015. A second active cliff site was discovered in 2017; and in 2020, Peregrines nested in a rock quarry. The history of every known Peregrine nest site since the population was reestablished in Maryland is presented in this paper, including a description of each nest site.

INTRODUCTION

Unlike most other birds, Peregrine Falcons (*Falco peregrinus*) do not build a nest of sticks or any other material. They simply lay their eggs on a ledge or other suitable flat surface, typically in a bowl-shaped depression or "scrape" made within gravel, soil, or other loose debris. Nest sites are usually on tall, vertical structures inaccessible to mammalian predators. Ideally the nest site has a wide view, is near water, has plentiful prey in the vicinity, and is seldom disturbed (Palmer 1988).

Historically, Peregrine Falcons nested at cliffs in Western Maryland and along the Susquehanna River. The species was never a common nesting bird in the state. Stewart and Robbins (1958) reported ten occupied nest sites in Maryland during the period 1932 through 1952. Though Stewart and Robbins (1958) did not publish a map in their book, Therres (1996b) included a map of seven historic eyries in the *Atlas of the Breeding Birds of Maryland and the District of Columbia* (Robbins and Blom 1996). By the mid-1960s, the Peregrine Falcon disappeared as a nesting species in the eastern United States due to reproductive failure caused by dichloro-diphenyl-trichloroethane (DDT) and other organochlorine pesticides, which inhibited the birds' ability to metabolize calcium and caused them to lay thin-shelled eggs (Hickey 1969). The subspecies *F. p. anatum*, which formerly nested throughout most of the continental United States and into Canada and Mexico, was listed as an endangered species in 1970 by the United States Fish and Wildlife Service (USF&WS 1970).

The use of DDT in the United States was banned in 1972, and reintroductions of this endangered species began in 1974 as the primary recovery strategy (Barclay and Cade 1983). Captive-bred young Peregrines were hacked at numerous locations in the eastern United States. Hacking is the process of introducing 3- to 4-week-old young Peregrines to the wild without interactions by adult parents. Peregrine nestlings were placed in a secure nest box on a ledge or man-made structure and provided food until they were fully developed and ready to fly. The process usually took up to three weeks before the young were released. Food was still provided after the young fledged until they had acquired the skills to hunt successfully.

The first reintroduction of Peregrine Falcons in Maryland occurred in 1975 on Carroll Island in Baltimore County on property owned by the United States Army (Therres et al. 1993). During the period from 1975 through 1984, 90 young Peregrines were hacked at seven tower sites in Maryland. Another 18 young were fostered by a female Peregrine that took up residence at the USF&G Building in downtown Baltimore.

Fruits of the reintroduction efforts in Maryland were realized in 1983, when Peregrines nested naturally at two sites (Therres et al. 1993). Two young fledged from a tower on South Marsh in Somerset County. A second pair attempted to nest on the Chesapeake Bay Bridge, but was unsuccessful. Since these first nesting attempts, the Peregrine Falcon breeding population has increased in Maryland and elsewhere in the eastern United States (Enderson et al. 1995). Due to the success of captive-breeding and reintroduction efforts, the *anatum* subspecies was declared recovered in 1999 by the United States Fish and Wildlife Service and removed from the federal endangered and threatened species list (USF&WS 1999). The species continues to be protected under the

Migratory Bird Treaty Act and the state's Nongame and Endangered Species Act.

Every year since those initial nesting attempts, Peregrines have nested in Maryland on various man-made structures, at two natural cliffs, and in one quarry. This paper reports on each nest site used since 1983 and the reproductive success at those locations. We define occupied nest site as a location occupied by a pair of Peregrine Falcons exhibiting territorial behavior or reproductive-related activity. Evidence for occupancy included observations of eggs, young, an incubating bird, a mated pair on or near the nest, a pair copulating, or at least one bird engaged in nest defense (Steenhof et al. 2017). Young fledged is defined as the number of nestlings that survived to banding age (18–30 days old) and presumed eventually fledged, or fledglings that were observed flying in the vicinity of the nest site.

The Peregrine Falcon nesting season in Maryland is generally during March through July (Therres 1996a). Adult Peregrine pairs are known to return to their nesting territories by early to mid-February in urban landscapes and a little later on coastal and bay islands (C. Koppie, unpubl. data). Eggs are usually laid in March and April, with young hatching in April and May. Most young fledge in May and June. Monitoring of nest sites was conducted annually at most of Maryland's nest sites from 1983 through 2012, then periodically thereafter.

NEST SITES IN MARYLAND

Nest sites in Maryland following reintroduction have primarily occurred on the Coastal Plain (Figure 1), an area of the state where Peregrines historically did not nest. A few of the occupied nest sites in Maryland have been located on the Piedmont and two in the mountains of Western Maryland. The differing range of the reestablished population is probably the result of a variety of factors, including the abundant, year-round supply of prey and comparative lack of natural predators found in coastal and urban areas, the greater number of potential nest sites within those areas owing to the species' adoption of man-made structures as breeding locations, and the fact that all of the captive-bred Peregrines hacked in Maryland, as well as most of those reintroduced in nearby states, were released within the Coastal Plain rather than in the mountains. In Maryland, successful hacking efforts occurred on specially designed towers erected in isolated tidal marshes of the Chesapeake Bay. These sites were located away from forested habitats that could potentially be inhabited by Great Horned Owls (*Bubo virginianus*), known predators of both young and adult Peregrines. The tidal marshes also provided an abundance of prey for the young Peregrines to hunt once they fledged (Therres et al. 1993). Hacking also occurred at Coastal Plain locations in other mid-Atlantic states (Watts et al. 2015).

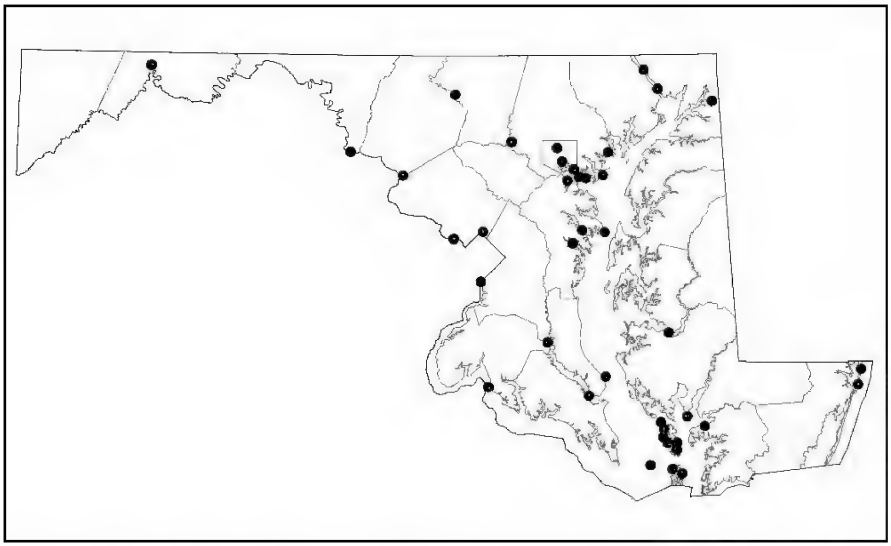

Figure 1. Map of known Peregrine Falcon nest sites in Maryland since 1983. The two westernmost sites are historic eyries that have become reoccupied.

Initially, all the marsh towers were monitored for Peregrine Falcon nesting attempts. As Peregrine pairs were observed and reported to us, those nest sites were confirmed and monitored as well. All known nest sites were monitored annually through 2012. Nest productivity data were documented, unhatched eggs and prey feathers were collected by C. Koppie, and nestlings were banded with standard federal leg bands and auxiliary colored leg bands with alpha-numeric coding. Monitoring of all known nests did not occur in any one year after 2012; however, they were monitored opportunistically.

Sites used by Peregrine Falcons in Maryland have all been on man-made, artificial structures with the exception of two natural cliffs and one rock quarry. Man-made sites have included marsh towers, bridges, buildings, and other structures (Table 1). Following are details of these nest sites.

Table 1. Nest sites used by Peregrine Falcons in Maryland: 1983–2020.

Nest Sites	County	Year First Occupied	Number of Years Occupied[a]	Number of Young Fledged[b]	Most Recent Year Occupied[c]
Marsh Towers					
South Marsh I	Somerset	1983	28	67	2015
Clay Island	Dorchester	1984	31	72	2015
Smith Island I	Somerset	1986	22	39	2007
Smith Island II	Somerset	1989	23	42	2011
Deal Island	Somerset	1990	22	44	2015
South Marsh II	Somerset	1996	19	43	2015
Spring Island	Dorchester	1998	17	27	2015
Bridges					
Chesapeake Bay Bridge	Anne Arundel	1983	38	73	2020
Key Bridge	Baltimore City	1986	24	13	2020
Potomac River Bridge	Charles	1988	17	37	2020
Solomons Island Bridge	Calvert	1998	9	9	2017
Curtis Creek Bridge	Baltimore City	1999	2	0	2000
Woodrow Wilson Bridge	DC	2005	11	21	2020
Susquehanna River Bridge	Harford/Cecil	2006	5	2	2020
Chesapeake City Bridge	Cecil	2007	7	1	2020
Severn River Bridge	Anne Arundel	2007	12	15	2020
American Legion Bridge	Montgomery	2007	11	11	2020
Choptank River Bridge	Dorchester	2013	1	1	2013
Edgewater Bridge	Anne Arundel	2020	1	1	2020
Monocacy River Bridge	Frederick	2020	1	3	2020
Buildings					
USF&G/Legg Mason/Transamerica	Baltimore City	1984	37	91	2020
Dunes Manor, 28th St, OC	Worcester	1992	1	0	1992
Sea Watch, 115th St, OC	Worcester	2019	1	3	2019
Hilton DoubleTree Hotel	Montgomery	2012	5	5	2018
Other Structures					
Adam Island Helicopter Tower	Dorchester	1995	3	2	1997
Millers Island Light	Baltimore	1997	22	37	2020
Crane Generating Station	Baltimore	2003	4	3	2020
Chalk Point Power Plant	Prince George's	2006	14	39	2019
Hooper Strait Marker	Dorchester	2006	1	1	2006
Hannibal Target	Chesapeake Bay	2010	8	2	2020
Sparrows Point Steel Mill	Baltimore	2010	2	8	2011
Dundalk Marine Terminal	Baltimore	2011	3	1	2018
Conowingo Dam	Harford	2011	4	3	2020
Bloodsworth Island Target	Dorchester	2012	1	2	2012
Roland Park Water Tower	Baltimore City	2016	5	10	2020
Cove Point LNG Platform	Calvert	2017	1	0	2017
Lehigh Cement Plant	Carroll	2017	3	7	2020
Cliff Sites					
Maryland Heights	Washington	2015	4	0	2020
Cumberland Narrows	Allegany	2017	4	2	2020
Marriottsville Quarry	Baltimore	2020	1	1	2020

[a] Number of years the site was known to be occupied by an adult pair.
[b] Total number of known young fledged or of fledging age over the years of occupation.
[c] Year that the site was last known to be occupied by Peregrine Falcons during the nesting season.

Marsh Towers

Seven marsh towers were specifically constructed for the recovery of Peregrine Falcons. Their original purpose was to serve as hack sites during the reintroduction period. The towers were constructed of wood, with four pilings driven into the marsh and a platform constructed on top of the pilings. The platform was generally 10 m (~33 ft) above the marsh. Two wooden boxes, back-to-back and enclosed on three sides, were placed in the middle of the platform. Aquarium-sized pea gravel was placed on the floor of each box as a nesting substrate. Six of these towers were eventually occupied by breeding pairs.

South Marsh towers

Two of the towers used by nesting Peregrine Falcons were on South Marsh in Somerset County. South Marsh Island is a Wildlife Management Area owned by the Maryland Department of Natural Resources. It is located in the Chesapeake Bay just west of Tangier Sound. This 1,200-ha (2,965-ac) island is entirely comprised of marshlands, punctuated by ponds and creeks. The first tower was constructed in 1980 on the southeast side of the island off Thomas Island Gut and served as a hacking platform (Therres et al. 1993). That year, six captive-bred young fledged from the tower. Six more young Peregrines were hacked there in 1982. No young were hacked from that tower in 1983 because a pair of adult Peregrine Falcons had taken up residence. The pair laid two eggs in one of the boxes in May. The eggs hatched and the two young fledged in July. This was the first successful nesting attempt in Maryland in over 30 years. Peregrines successfully raised young at this tower every year except for three through 2009. In total, 67 young were produced at this nest site.

In 2002, two of four young hatched at the tower were relocated to Maryland Heights as part of a reintroduction effort at the historic cliff nest site along the Potomac River in Washington County. Releases were conducted at this historic eyrie by the National Park Service on property they owned as part of Harpers Ferry National Historical Park. Maryland Heights is opposite the town of Harpers Ferry, West Virginia. Peregrines were known to nest at Maryland Heights in the 1930s and 1940s (Wimsatt 1939, 1940). The last known nesting occurred in 1950 when falconer Brian McDonald (pers. comm.) observed three young in the nest. Two hack boxes were placed on the cliff in 2001, and releases began that year. Young hacked at the cliff site were taken from nests in Maryland and Virginia. During the five-year project, 25 young from Maryland nests were hacked at Maryland Heights, including one of three young removed from the first South Marsh tower in 2003 and another two of three young in 2005. The last nest survey conducted at this tower occurred in 2015, when two young were produced.

A second tower platform was constructed on South Marsh in the fall of 1989 about 4 km (2.5 mi) north of the first tower at the northern tip of South Marsh Island. A female Peregrine Falcon visited the tower almost immediately. However, the first successful nesting attempt did not occur until 1996, when three young were produced. Peregrines nested there successfully in 12 of the next 17 years. In 2001, one of four young was relocated as part of the hacking effort at Maryland Heights. In 2003, two of four young were relocated to the cliff site. In 2004 and 2005, another two of four young and two of three young, respectively, were also relocated to Maryland Heights. The last known nesting attempt at the second South Marsh tower occurred in 2015, but failed. The site produced at least 43 young Peregrines over the 19 years it was used.

Clay Island tower

The Clay Island tower was constructed in 1981 on the Fishing Bay Wildlife Management Area in Dorchester County. Clay Island is at the southern tip of the Elliot Island peninsula. The tower was located near Little Creek and served as a hack site for three years (1981–1983), with 13 young Peregrines fledging from there (Therres et al. 1993). In 1984, a pair of adult Peregrines used the tower as their nest site. They produced three young and successfully fostered a fourth that year. Three young were presumed depredated by Raccoons *(Procyon lotor)* in 1989. Peregrines nested successfully each year thereafter until 2000, when their one egg failed to hatch.

In 2002, one of four young from Clay Island was translocated and released at Maryland Heights. The next year, one of three young was relocated to the cliff hack site, and in 2005 another one of three young was hacked there. The last year the Clay Island tower was known to produce young was in 2015 when they fledged three. In total, 72 young Peregrines were produced at this site, making it the most productive of the marsh towers in Maryland.

Smith Island towers

In 1984, a marsh tower was constructed in Martin National Wildlife Refuge on the western side of Smith Island near Lighting Knot Cove. Six young Peregrines were successfully hacked in July of that year (Therres et al. 1993). That was the last hacking effort in Maryland until releases began at Maryland Heights in 2001. In 1986, an adult pair took up residence at the tower and successfully raised three young. Peregrine Falcons raised young at this tower for 14 of the 18 years they nested at the site, producing 39 young. By 2003, the nest box atop the tower was gone, having apparently been destroyed by high winds, but the pair tried unsuccessfully to nest on the tower for a few more years.

A second tower was erected on the eastern side of Smith Island near Anderson Creek, approximately 5.6 km (3.5 mi) south of the first tower, in 1989 after a pair of Peregrines were seen frequenting the area. That pair did not nest that year

and the second tower was not used as a nest site until 1992, when one young was successfully raised. Young were successfully produced at this tower for the next ten years. Though a pair of adults was present for the following five years, no evidence of nesting was found. In 2008, two eggs were laid but did not hatch. Young were successfully produced again in 2009 and 2010. The last year the tower was occupied was 2011, but no nesting attempt was documented.

Deal Island tower

The Deal Island marsh tower was constructed on the Deal Island Wildlife Management Area near Dames Quarter just west of Pigeonhouse Creek in 1987. In March 1989, a single female Peregrine Falcon was observed at the tower, but she remained unmated, and the tower was occupied by Barn Owls (*Tyto alba*) that year. The female Peregrine subsequently attracted a male, and eggs were laid on the tower in April 1990. The pair successfully raised two young that year. In 1993, the nest was depredated by Raccoons when one of the predator guards separated from a support pole. Young were successfully raised the next 13 years. Then in 2007, the nest box was blown off the tower by high winds early in the year, spoiling the nesting season. The nest box was recovered from the marsh and later resurrected by C. Koppie and Kennon Smith. After an additional year of unsuccessful nesting attempts, four young were produced in 2009. That was the last year of successful nesting by Peregrines at this tower.

Spring Island tower

A marsh tower was erected on Spring Island to attract the nesting Peregrines away from a nearby island used by the United States Navy. Adam Island is part of the Bloodsworth Island complex in Dorchester County used by the Navy for weapons testing. In 1997, a pair of adult Peregrines nested on an abandoned elevated structure at the former United States Navy's Adam Island Heliport Tower. However, military activities required relocation of the nest site to a new tower placed on Spring Island, approximately 2 km (1.2 mi) southeast of Adam Island. The Navy, in consultation with the United States Fish and Wildlife Service, constructed the new tower on the National Wildlife Refuge property to minimize impacts to a federally-listed species. The Peregrine Falcons relocated to Spring Island in 1998 and successfully raised two young. Peregrines nested on this tower through 2015, successfully producing young in 12 of the 17 years the nest site was used.

Bridges

Most of the large bridges in Maryland have been used as nest sites by Peregrines beginning in 1983. Bridges are some of the tallest structures on the Coastal Plain and usually have a steady source of Rock Pigeons (*Columba livia*) and other prey. Peregrine Falcons have nested on bridges in several other eastern states as well (Faccio et al. 2013, Gahbauer et al. 2015, Watts et al. 2015).

Chesapeake Bay Bridge (William Preston Lane Jr. Memorial Bridge)
The Chesapeake Bay Bridge has been the longest occupied nesting site for Peregrine Falcons in Maryland. A pair of Peregrines took up residence at the bridge in 1983, prior to the placement of a nest box. In April of that year, two nest boxes were installed and placed on the westbound span of the dual bridge; one on each side of the main channel. On the channel side of the piers, there is a flat area about 6 m (20 ft) below the road surface where the location for the nest boxes was deemed most suitable. Though the adults were observed in the western box in 1983, presumably incubating eggs, no eggs or young were ever found. The first successful nesting attempt occurred in 1984 when two young successfully fledged. Seven young in total were raised in the western nest box the following two years. In 1987 and 1989, the Peregrines used the nest box on the eastern channel pier and successfully fledged two young in both years. In 1988, two more young were fledged from the western channel pier. Young were produced there in 16 of the following 18 years. A pair nested on the westbound span for 23 years.

During the 2000 nesting season, a recently fledged young Peregrine was rescued beneath the Chesapeake Bay Bridge hanging onto a barge railing. The fledgling was most likely produced elsewhere on the bridge, perhaps by a second pair of Peregrines, though no other nest site was found. Being a late fledgling, there were no opportunities to foster this bird to a wild nest. With limited human exposure and training by C. Koppie, the Peregrine was provided live prey to develop her skills for future survival in nature. She was later banded and released. In 2002, this Peregrine was observed nesting on a building in Cleveland, Ohio (Sarah Sanders, Ohio DNR, pers. comm.)

In 2007, major renovations that would adversely impact the Peregrines nesting on the westbound span of the Bay Bridge were scheduled to begin. Two nest boxes were placed on the eastbound span on each side of the main shipping channel as alternative nesting sites. The new boxes were only a few hundred meters from those on the westbound bridge. They were placed on the rail of the catwalk below the road surface, and the box on the westbound span was removed. The resident female, an unusually aggressive bird originally hatched in a nest on a building in New York City, began showing defensive behaviors toward construction workers on the westbound span. Federal and state agencies subsequently decided to remove her in the hope that her replacement would be less aggressive. In November 2006, she was successfully trapped using a mist net and owl replica on the westbound span and removed from the bridge by C. Koppie and G. Therres. After being held in captivity at the Salisbury Zoo for more than four years, she was released back into the wild in February 2011 but did not return to the Bay Bridge. Following the removal of the resident female, a new female Peregrine took up residence on the eastbound span. Six eggs were observed in the nest box on the western side of the main shipping channel in

2007, but they did not hatch. Three young were produced in 2008 at this nest site. At least 13 more young were raised there over the next 12 years. We were unable to monitor the nest box for seven of those years, so it is likely more young were produced but not documented.

The Bay Bridge was used by Peregrine Falcons more than any other nest site in Maryland and was the most productive of the bridge nest sites, with at least 73 young having been produced there during 38 years of occupancy.

Key Bridge (Francis Scott Key Bridge)
The Key Bridge was the second bridge structure in Maryland to serve as a Peregrine nest site. The presence of nesting Peregrines on the Key Bridge was reported to the Maryland Department of Natural Resources by a bridge inspector in 1986. The nest site was located above the south channel pier inside an opening of the bridge infrastructure which rests on a concrete cap of the anchor pillar. That structure had oval openings that the adult Peregrines used to access the chamber. The nest chamber was approximately 20 m (66 ft) below the road surface of the bridge and situated halfway between the outer bridge beams. That first year, two addled eggs were found in the nest.

The first successful nesting attempt occurred in 1988 when one young fledged. Eggs were laid at the Key Bridge for the next 12 years, but no young were produced. During successive years of nest monitoring, C. Koppie frequently observed wet conditions at the nest location, likely a factor resulting in the loss of productivity. A nest tray with pea gravel was installed. The pair successfully raised three young in 2001 and produced five more through 2004. One of three young in 2001 was relocated to Maryland Heights for hacking. In 2003, two of four young were also relocated to Maryland Heights. Monitoring of this nest site was rare after 2004. In 2020, three young were produced at the Key Bridge. Young were produced in only six of the 18 years that eggs were documented. The causes for the high rate of nesting failure on this bridge are unknown. In 1997, a clutch of three addled eggs was collected from this site and analyzed for chemical toxicants along with eggs that failed to hatch from other nest sites in Maryland, Delaware, and Virginia. Results of the analyses were inconclusive, although numerous types of metal residues were present at lower levels in the eggs (Clark et al. 2009).

Potomac River Bridge (Governor Harry W. Nice Memorial/Senator Thomas "Mac" Middleton Bridge)
In 1988, the U.S. Route 301 bridge over the Potomac River from Charles County to the Virginia shoreline became the third bridge used by nesting Peregrines. That year, a pair was confirmed at the site, but no evidence of nesting was found. The first successful nesting attempt occurred in 1999 when three young were raised. Starting in 2002, Peregrines nested successfully at this

site for 11 of the next 12 years. In 2002, three young were produced, of which two were relocated to Maryland Heights. One of those relocated young was later observed as a breeding adult female at the Chesapeake Bay Bridge in 2009. Interestingly, her mate that year was a male that had dispersed from a nest site in Ohio, which was the first documented case of a Peregrine dispersing from the Midwest to nest in a Mid-Atlantic state (C. Koppie, unpubl. data). That pair remained in residence and produced many young at this bridge until 2020.

Solomons Island Bridge (Governor Thomas Johnson Memorial Bridge)
The Maryland Route 4 bridge at the mouth of the Patuxent River linking Solomons Island to St. Mary's County was the fourth bridge used by nesting Peregrine Falcons in Maryland. The nest site was at the center span concrete support of the 2.2 km (1.4 mi) bridge over the main channel of the Patuxent River. In 1998, three young were fledged from the bridge. In 1999, the Peregrine pair nested in an Osprey (*Pandion haliaetus*) nest atop the bridge anchor pier. They produced one young that year. Two young were produced the following year. After that, the nest site under the bridge road deck was challenging to monitor due to difficulties accessing the nest. Young were observed at the bridge in 2013 and 2014. The last known occurrence of a pair of adults at the bridge was in 2017.

Curtis Creek Bridge
In 1999, a pair of adults was documented frequenting the Interstate 695 bridge over Curtis Creek in Baltimore City near the Anne Arundel County border. No nest was ever confirmed. Only a single adult female was observed again in 2000, but not thereafter.

Woodrow Wilson Bridge (Woodrow Wilson Memorial Bridge)
A pair of Peregrine Falcons took up residence at the Woodrow Wilson Bridge across the Potomac River south of Washington, D.C., in 2005. Technically, the nest site was on the District of Columbia portion of the bridge. Two eggs were laid that year, but they were gone by the next time the nest was surveyed. Soon thereafter, new construction was approved to replace the former bridge. The pair successful raised two young in 2007. A nest box was installed by C. Koppie on the new bridge following its completion. The pair adopted the nest box and successfully produced young in five of the eight years from 2008 through 2015. A pair of adults was observed at the bridge in 2020 but did not use the nest box that year.

Susquehanna River Bridge
After many years of Peregrine observations near the three bridges crossing the Susquehanna River in Maryland, a pair was documented in the vicinity of the Interstate 95 bridge in 2006. They were present at the bridge the next year, but it is unknown if they attempted to nest. In 2008, a pair was observed at the bridge

before the nesting season, but it wasn't until 2017 that a pair was documented at this site again. In 2019, two lightly pigmented eggs were found in the bridge infrastructure above the main catwalk that year, but there was no evidence that young were produced (Kyle Spendiff, pers. comm.). It was unknown why the eggs were addled or even in what year the eggs may have been laid. The eggs may have been abandoned early during egg-laying prior to the completion of the full clutch. The I-95 bridge was scheduled for maintenance and painting in upcoming years. Two boxes were designed and installed at each end of the bridge prior to the 2020 nesting season as a proactive measure to minimize future impacts to nesting Peregrines. The pair was present again in 2020, but there was no evidence of the Peregrines using either box when they were inspected.

American Legion Bridge (American Legion Memorial Bridge)
A pair of Peregrine Falcons was found nesting under the American Legion Bridge over the Potomac River in 2007, after having been observed there the previous year. The bridge links the Maryland portion of Interstate 495 to the Virginia portion of the Capital Beltway around Washington, D.C. The bridge is only about 15 m (49 ft) above the river, making it one of the lowest nest sites used by nesting Peregrines other than the marsh towers.

A project to repaint the support structure under the roadbed began early in the breeding season, but the Peregrines persisted in their nesting attempt despite considerable disturbance by workers. A nest tray was installed on a pier cap over the main channel, but eggs were later found in multiple other locations, including on top of an anchor pier on the Virginia side of the river. In February 2008, a nest box was installed on a pier cap over the main channel to minimize future disturbance to nesting Peregrines. The pair adopted it and successfully fledged three young. In 2009, three eggs were laid but did not hatch. The pair produced at least one young in 2010, but the outcome was unknown. Three young were successfully raised in 2012 and four more the following year. The pair fledged three young in 2016 and produced one in 2017. At least one young fledged in each of the next three years.

Despite several replacements of her mate, the original banded female was in residence there at least through the 2019 breeding season. In 2008, having missed the opportunity to band the young prior to fledging, C. Koppie initiated a plan to live-trap the Peregrines. All three fledglings and both adults were captured at ground level during two attempts, which allowed for the banding of the fledglings and the accurate reading of the leg bands of each adult. The female was banded in 2004 as a nestling at the Throgs Neck Bridge in New York. In 2019, at the age of 16 years, she was one of the oldest Peregrines known to have nested successfully in Maryland.

Chesapeake City Bridge
A pair of adult Peregrine Falcons was observed at the Maryland Route 213 bridge across the Chesapeake and Delaware Canal at Chesapeake City in Cecil County in 2006. No evidence of nesting was found. In 2007, two eggs were documented below the road deck near the center of the bridge. An inspection revealed two eggs laid on bare concrete within a bridge support; they ultimately failed to hatch. There were limited opportunities for natural nesting or the placement of a nest box at this bridge due to a lack of safe access. For the next several years there were no reports of Peregrines, and then a pair of adults was observed again in 2015 through 2020. In 2018, Erik Yetter (unpubl. data) observed a fledgling and an adult on 12 July. It is unknown if any other young were raised there. The outcome of any nesting attempts in 2019 and 2020 is unknown.

Severn River Bridge (Pearl Harbor Memorial Bridge)
In 2007, a pair of Peregrine Falcons began nesting on the U.S. Route 50/301 bridge that spans the Severn River. They produced one young. A nest box was installed under the bridge in 2009. A pair was observed at the bridge for the next few years, but the outcome of any breeding attempts that were made is unknown. Then in 2012, three young were raised and the following year four young were produced on the bridge. The tarsal bands identified the adult female as originating from a high-rise building in Richmond, Virginia. Three young were produced in 2015, but one was found dead on the bridge shortly after fledging (Dan Haas, pers. comm.). One more young was produced in 2017. A pair was in residence at the bridge as of 2020.

Choptank River Bridge (Frederick C. Malkus Bridge)
Guy Willey, Sr. (unpubl. data) observed an adult Peregrine aggressively defending the U.S. Route 50 bridge over the Choptank River in the early 2000s, but no nest was found. Then in 2013, one young was produced within a structural opening of the closed old bridge adjacent to the newly constructed bridge. It was later rescued by a boater after falling into the river after fledging. The fledgling was uninjured, so it was placed on a concrete wall near the scrape. No further nesting was documented at this bridge after 2013.

Edgewater Bridge (South River Bridge)
The Maryland Route 2 bridge over the South River in Edgewater was periodically visited by sub-adult Peregrine Falcons in 2018 and 2019. During the 2020 nesting season, a young Peregrine was observed perched at the bridge (Dan Haas, pers. comm.).

Monocacy River Bridge (Monocacy River Railroad Bridge)
A pair of Peregrines nested in 2020 on the railroad bridge near the mouth of the Monocacy River, 2 km (1.2 mi) northwest of the town of Dickerson. The pair

was first observed by Julie Maynard (pers. comm.) on 17 June. The bridge was visited again in the late afternoon of 28 June, and the pair was found to have fledged at least three young. The exact nest location on the bridge was unknown.

Buildings and Other Structures

Tall buildings and other structures in the Coastal Plain also attracted Peregrines to use as nesting sites in Maryland. As with bridges, buildings have served as nest sites in many other eastern states (Faccio et al. 2013, Gahbauer et al. 2015, Watts et al. 2015).

USF&G/Legg Mason/Transamerica Building

In 1978, a female Peregrine took up residence at what was then the USF&G Building in downtown Baltimore. This 37-story office building was located on Light Street in the Inner Harbor area of the city. All four sides of the building have ledges from the third to the 35th floor. The female selected the southwest corner of the 33rd floor ledge as her roosting site. Nest trays containing small-sized pea gravel were placed at her favored sites. Over the next five years, the female paired with several adult males that had been released by captive breeders but was unsuccessful in producing any young of her own. However, she fostered 18 young placed in her nest over that five-year period (Therres et al. 1993).

An adult male Peregrine arrived in the summer of 1983. He was unbanded and thus likely a wild bird not released as part of the captive-breeding and reintroduction effort. The new pair mated the following year, and the female laid four eggs in late February and early March. The eggs hatched in April, and all four young successfully fledged. This was the first successful nesting by Peregrine Falcons on a building in Maryland and the first known successful nesting in an eastern United States city since the 1950s. Unfortunately, the female died of a severe throat infection in September of that year (Therres et al. 1993). The male was able to attract a new mate, and in March 1985, four eggs were laid. All four young fledged that year; however, two subsequently died after flying into reflective glass windows. Young were successfully raised at the building for the next ten years.

During the 1996 nesting season, five eggs were laid in March, but shortly thereafter the female disappeared and was presumed dead. Within a week of her disappearance, the male Peregrine attracted a new mate. The new pair did not produce any young that year—incredibly, the only failed breeding attempt in 37 years of nesting at this site—but they successfully raised three young the following year.

The investment management company Legg Mason took over tenancy of the building in 1998. The new management continued the then-20-year tradition of supporting the nesting of Peregrines at 100 Light Street. That year, four young fledged from the site. In 2002, one of four young produced was translocated to Maryland Heights as part of the hacking effort there, and one of three young was relocated there in 2004.

Transamerica Life Insurance Company leased the building in 2010 and moved in the following year. As with the prior tenants, Transamerica continued to support the nesting of Peregrines there, including the monitoring and banding of the young. To that end, in 2015, the Chesapeake Conservancy installed a live webcam on the nest, making it the only Peregrine Falcon eyrie in Maryland where the daily goings-on were broadcast to viewers around the clock. Young were raised in front of the camera the next several years, including four in 2018, two in 2019, and three in 2020.

During the 37 years of nesting at the office building in downtown Baltimore, 91 young were known to have been produced, not including the 18 young fostered by the original female Peregrine, making it the most productive site in Maryland for nesting Peregrine Falcons.

Ocean City high-rise buildings (Dunes Manor Hotel; Sea Watch)
In 1992, the Dunes Manor Hotel on 28th Street in Ocean City attracted a pair of Peregrine Falcons. John Barber (pers. comm.) observed a female there in early March of that year. A smaller Peregrine, presumably a male, was also seen in the same area. The pair frequented the 12th floor of the hotel on the beach side of the building, but there was no flat surface there for eggs to be laid. A decision was made to not place a nest box on the building as the hotel management did not like all the unsightly prey remains on the property. The pair was not seen the following year.

Though Peregrines were observed regularly in Ocean City, no nesting was confirmed until 2019. In May, an adult Peregrine Falcon became vocal in response to residents living at the Sea Watch condominiums on 115th Street about the same time a Peregrine nestling was found on the ground below. A nest with two young in a large flower pot measuring 33 cm (13 in) in diameter and 30.5 cm (12 in) tall was discovered on the 19th floor balcony of an unoccupied unit. After discussing the conflict with the building manager, U.S. Fish and Wildlife Service and Maryland Department of Natural Resources biologists decided to install a nest box to ensure public safety and protect future nestlings. On 14 June, C. Koppie and Dave Brinker installed the box on the roof of the building and transferred the single remaining nestling (by then, one had already disappeared). The adult male successfully located his young and provided a freshly caught bird. The adult female was subsequently found dead at a nearby

tall building. She was identified via her leg bands as having been banded in 2014 in a nest on a building in Taunton, Massachusetts. The following season, only a single adult was observed near the nest box, presumably the resident male.

Hilton DoubleTree Hotel (DoubleTree by Hilton Hotel)
The Hilton DoubleTree Hotel in Silver Spring served as a nest site from 2012 through 2018. The nest was found on a 12th floor ledge between a room window and wing wall support. According to building management personnel, numerous Rock Pigeons used the location during prior winters for protection against inclement weather. Their droppings provided suitable substrate on which the Peregrines were able to make a scrape. In 2012, one of four eggs laid hatched. In June of that year, the single young fledged and was found on the street below. That young bird was later returned to the roof of the building and was greeted by one of the adults. Two young were successfully raised by the pair in 2014, and another two more were produced in 2018. Otherwise, the recent breeding history of this site is unknown.

Adam Island Heliport Tower
In 1995, a pair of Peregrine Falcons was observed at the defunct Adam Island Heliport Tower. Adam Island, which is owned by the United States Navy, is located just southwest of Bloodsworth Island in the Chesapeake Bay. An adult pair was present again in April 1996, but no evidence of nesting was found. A nest box was installed on a metal tower, and the following year the pair adopted it and successfully raised two young. Future mission activities necessitated the relocation of the nest box. After consulting with the United States Fish and Wildlife Service, the Navy constructed an alternate tower structure and nest box at nearby Spring Island, which the pair accepted and continued to occupy.

Millers Island Light (Craighill Channel Lower Range Light Rear)
Gene Scarpulla (pers. comm.) reported a pair of adult Peregrine Falcons frequenting the Millers Island Light in early February 1997. The lighthouse was located just south of the mouth of Back River in Baltimore County near Pleasure Island. In 2000, the pair raised two young in the top of the lighthouse, which they accessed through a broken window. A nest box was subsequently installed on the top floor's outer ledge. The following year, three of four young were relocated to Maryland Heights as part of the hacking effort there. Though Peregrines occupied the lighthouse for several years thereafter, no evidence of nesting was found. Then in 2006, the pair raised three young. A male that fledged from the lighthouse in 2015 was observed three years later nesting on the Roland Park Water Tower in Baltimore City, where he subsequently fledged ten young of his own. Two young were produced at the lighthouse in 2018 and at least one in 2020.

Crane Generating Station (Charles P. Crane Generating Station)
In 2003, a pair of Peregrine Falcons occupied the power plant off Carroll Island Road in eastern Baltimore County along the shores of Seneca Creek. A nest box was placed on the administration building that year and appeared to have been visited. However, no young were known to have been produced, and corporate managers elected to remove the box. In 2016, the power plant was reoccupied by a Peregrine pair that found a new nest location on one of the plant structures within the compound. Three young were produced that year. The pair also produced three young in 2018. The site was still occupied in 2020, although the outcome of that year and the prior year are unknown.

Chalk Point Power Plant (Chalk Point Generating Station)
In 2006, Peregrine Falcons were found nesting at the Chalk Point Power Plant along the Patuxent River in southern Prince George's County and they produced two young. The Peregrines used a nest box located on a metal grate extending from one of the smokestacks approximately 122 m (400 ft) above the ground. Young were produced there in 11 of the next 13 years. A male that was banded and fledged from the power plant in 2012 was found four years later nesting on an office building in Reston, Virginia, where he has since fledged 23 young of his own. In 2019, five young were produced at the power plant. In total, 39 young were known to have been raised at this nest site.

Hooper Strait Marker
In 2006, a boater observed and reported Peregrine Falcons on a channel marker in Hooper Strait. The Peregrines nested in an Osprey nest atop channel marker #4 located in the waters of Dorchester County between Lower Hooper's Island and Bloodsworth Island. At least one Peregrine chick was produced on the marker. It is not known if Osprey were present at the channel marker and the Peregrines successfully defended their adopted nest, or that the Osprey did not return to the channel marker that year. The following year, the site was occupied by nesting Osprey instead of Peregrines.

Sparrows Point Steel Mill
An employee at the Sparrows Point Steel Mill observed and reported an active Peregrine Falcon nest at the steel plant in 2010 and 2011. The pair nested on the outside ledge of a factory building containing years of residual ash debris. The pair produced four young each year. No further nesting was documented at this site after 2011 after a change in ownership resulted in the removal of several buildings, including the one used by the Peregrines.

Hannibal Target (USS *Hannibal* (AG-1))
A pair of Peregrine Falcons adopted an old United States Navy ship used as a target by fighter planes out of Patuxent Naval Air Station (now Naval Air Station Patuxent River). Known as Hannibal Target, this World War II liberty ship was grounded as a bombing target on a shallow sandbar about 11 km (7 mi)

northwest of Smith Island. Peregrines were first observed at the dilapidated ship in 2010. The nest location was on the southern side of the ship, approximately one-third of the way forward from the stern to the bow, on the outside floor of the second deck, under an overhang and behind a handrail. Two young were produced in 2011. Peregrines occupied the target ship through 2020, but it is not known if they raised any other young during those years.

Bloodsworth Island Target (Bloodsworth Island Range)
In 2012, a pair of Peregrine Falcons successfully raised two young on a United States Navy target offshore of Bloodsworth Island (Kyle Rambo, unpubl. data). The nest was in the northwest corner of the steel target. No additional observations were made at this site.

Conowingo Dam
In 2011, a pair of adult Peregrines was observed at Conowingo Dam, but did not appear to nest. In 2013, a pair utilized a section of building infrastructure under the lower roof enclosing the dam's generators and produced three young. The Peregrines nested on a concrete ledge associated with a retractable wall partition that operated much like a giant garage door. Due to potential emergency operations that would require opening the wall to move large crane equipment, the Exelon Corporation (owners of the dam) requested that the young be relocated for their safety. A nest box was installed above the roof, where the young were soon transferred and later fledged. The pair was suspected to have fledged at least one young in 2018. Adult Peregrines continued to be observed at the site through 2020, but the breeding outcomes are unknown.

Roland Park Water Tower (Roland Water Tower)
A pair of Peregrine Falcons has nested in the historic, early-1900s-era water tower in the Roland Park neighborhood of Baltimore City since at least 2016. The octagonal tower, which is located at the junction of Roland Avenue and University Parkway, is 49 m (161 ft) tall and made of brick and terra cotta with a roof capped with green tiles. The structure looks more like a lighthouse than a modern water tower. The pair, which nested within the deteriorated eaves of the tower, had been monitored regularly since 2018 and successfully fledged three young that year, four young in 2019, and three more in 2020. In early July of 2020, the adult female was found dead near the tower (Terry Ross, pers. comm.). As previously noted, the resident adult male originated from the Millers Island Light, where he was banded by C. Koppie as a nestling in 2015. The tower was scheduled for a major restoration beginning in September 2020 into the following year. Plans were made to construct a box to be installed near the top of the water tower as part of the restoration effort.

Cove Point LNG Platform (Cove Point LNG Terminal)
In 2017, three eggs were laid at the LNG platform in the Chesapeake Bay 1.2 km (0.7 mi) offshore of the Calvert County shoreline. The platform is

approximately 20 m (66 ft) above the water. The Peregrines nested at the union of a concrete cap and steel beam support, which they accessed via an opening beneath the dock platform. Unfortunately, the eggs never hatched, and no further nesting attempts or observations of the pair were documented at this site. The platform had previously been occupied by an adult female Peregrine Falcon, which was observed there by Wanda Cole (unpubl. data) on 10 April 2001, exhibiting behavior consistent with defense of a nesting territory. No nest was found that year.

Lehigh Cement Plant (Union Bridge Cement Plant and Terminal)
In 2017, nesting occurred in a tower at a cement plant in Union Bridge in Carroll County. An employee showed falconer Paul DuBois (pers. comm.) video footage of a female Peregrine on eggs recorded by a camera that was apparently installed to monitor the birds. He learned that a pair had been attempting to nest at least the past few years on an exterior platform on the 145 m (476 ft) preheater tower. According to P. DuBois, the female laid eggs on bare metal in a location that did not have any accumulated substrate and was also adjacent to an exhaust vent that discharged potentially harmful particulates. The pair failed to hatch any young, and P. DuBois was later shown footage of the female removing cracked eggshells. Plant management fabricated and installed a nest box in 2019, and the pair subsequently produced three young that year. The pair successfully nested again in 2020, raising three young that were banded by C. Koppie prior to fledging.

Dundalk Marine Terminal
In mid-April 2017, federal and state wildlife agencies were notified of a pair of Peregrine Falcons harassing a crane operator on one of the off-loading cranes at the Dundalk Marine Terminal in eastern Baltimore County. At that point, the operator had not yet located a nest location. Upon closer inspection of the crane by the United States Fish and Wildlife Service it was discovered that the female Peregrine had made a scrape and laid four eggs in a pea-gravel-lined metal tray installed to collect spills from a fuel-oil-powered electrical generator. A follow-up meeting with plant officials resulted in a plan to construct a nest box or platform on a nearby decommissioned crane of the same height; however, the eggs went missing before the box was installed. In 2018, a nest box design was provided to management, who subsequently constructed and installed it. The following nesting season, the pair located and occupied the nest box, where they laid three eggs and hatched one young.

Cliff Sites

Historically, cliffs along the Potomac and Susquehanna rivers served as nest sites for Peregrine Falcons in Maryland prior to their extirpation from the eastern United States (Stewart and Robbins 1958). Nests were located on rock

ledges. No Peregrines were found nesting on cliff sites in Maryland for over 40 years after reintroduction efforts began. That changed in 2015.

Maryland Heights

Maryland Heights is a cliff along the Potomac River across from Harpers Ferry, West Virginia. It is now owned by the National Park Service as part of Harpers Ferry National Historical Park. It was the last known historic nest site of Peregrine Falcons in Maryland, with a pair producing three young there in 1950 (Brian McDonald, pers. comm.). Between 2001 and 2005, 29 young Peregrines were released at the cliff through a hacking program, which was a collaborative effort between the National Park Service, United States Fish and Wildlife Service, Maryland Department of Natural Resources and other partners. Most of the young hacked at Maryland Heights came from nest sites previously discussed in this paper.

On 15 March 2015, a pair of Peregrine Falcons was observed at Maryland Heights and appeared to have appropriated an old stick nest on a ledge to the left of the sign painted on the cliff face. Neither Peregrine was banded, so they were not among the birds previously hacked there. During subsequent observations in March and April, the pair exhibited behavior suggestive of incubation, but the male was only observed sporadically, and throughout the spring it became increasingly unclear whether or not the pair was indeed attempting to nest. Both birds were observed during the fourth week of May, but they did not exhibit any behavior suggesting they had eggs or young, and by the end of that month it was clear that any nesting attempt they may have made had failed. The National Park Service instituted a partial closure of the cliff to rock climbers, but it was minimal in extent, consisting of only two of six delineated sections of the cliff face. It did not include the clifftop overlook and only took effect the first week in April, by which time a significant amount of disturbance by both climbers and hikers had already occurred. This may have contributed to the pair's atypical behavior and ultimate failure.

Similarly, in 2016, a pair consisting of the same unbanded female that had been present the previous year and a new, banded male occupied Maryland Heights. Copulation was observed from 20 February until at least 26 March. The female exhibited behavior consistent with incubation during two observations made at the end of April and beginning of May, but once again the Peregrines' behavior was atypical, and by the end of May, it was clear they did not have eggs or young.

In February 2017, Rolf Gubler and Alan Williams (pers. comm.) of Shenandoah National Park visited Harpers Ferry to inspect the two ledges on Maryland Heights on which the Peregrines may have attempted to nest to determine whether exposure to the elements, accessibility to predators, or other characteristics of the ledges themselves could have contributed to the

Peregrines' repeated failure. Williams rappelled to the ledges and modified them by removing sticks and other organic material from what had likely been old nests of Common Ravens (*Corvus corax*). He also placed additional nesting substrate consisting of native stones and gravel collected from around the cliff by Harpers Ferry staff. Unfortunately, neither Maryland Heights nor any of the surrounding cliffs or bridges were occupied by Peregrine Falcons that year.

In December 2018, a local birder reported an unbanded adult male Peregrine frequenting a ledge on the cliff near the faded old sign. The male attracted a new adult female in March of the next year, and the pair were seen courting and investigating potential nest ledges. But hopes for the first successful nesting on the cliff since the early 1950s were dashed when the male vanished the first week of April. On 8 April, four days after the male was last observed at Maryland Heights, the carcass of an unbanded adult male Peregrine Falcon was found on a nearby KOA campground (National Park Service, unpubl. data). On necropsy, it was found to have a vertebral dislocation of the cervical spine with associated hemorrhaging and a laceration over its right dorsum. It is plausible, due to the nature of its injuries and location of its recovery halfway between Maryland Heights and a quarry known to be occupied by Peregrine Falcons in nearby Millville, West Virginia, that the male may have been killed in an intraspecific territorial dispute or possibly by another large raptor. The resident adult female and a second-year male were observed at Maryland Heights into summer, but no breeding attempts were made, and those Peregrines eventually dispersed as well.

Observations of an individual Peregrine Falcon in the park were made in October and early November of 2019, and then later in November, a pair began to be observed frequenting Maryland Heights. The pair persisted throughout winter and in January and February of 2020 were seen conducting mutual ledge displays and other courtship behavior on the cliff. The National Park Service instituted a closure of both the cliff face and clifftop overlook effective15 February through 31 July. It was more extensive than in previous years, consisting of five of six delineated sections of the cliff, and more clearly marked with orange temporary construction fencing and new signage. On 27 March, both adults were observed incubating on a ledge above the train tunnel. This was the first definitive observation of incubation on Maryland Heights in the six years since the cliff had initially become reoccupied. Incubation continued to be observed until 20 April, at which time neither bird was seen to visit the nest ledge during a three-hour observation. Four days later, the eyrie was viewed with a spotting scope from across the river and appeared to be empty. After the apparent failure of their first attempt, the pair resumed copulation and exhibited other courtship behavior indicating they might renest on a different ledge above the painted sign. Incubation-like behavior was observed on this ledge in May

and June, but it was inconsistent, and a check of the ledge from a clifftop vantage point on 12 June showed it to be empty.

Cumberland Narrows

On 24 March 2017, M. Olear discovered a Peregrine Falcon pair on Wills Mountain in the Narrows just outside of Cumberland, a historic eyrie known to be occupied at least until the late 1940s. Copulation was observed, and egg laying was expected to occur in the next few weeks. Portions of the cliff and surrounding land are owned by both private entities and the Maryland Park Service, which imposed a partial, seasonal closure of the cliff to protect the nesting Peregrines. By late April, it was believed egg laying had begun or was imminent. A single chick about a week old was observed on 16 and 17 June. This was the first Peregrine young known to hatch on a cliff in Maryland in nearly 70 years. Unfortunately, the lone nestling disappeared sometime between 29 June, at which time it appeared to be about 20 days old; and 8 July, when C. Koppie and M. Olear visited the nest site and discovered that the nesting attempt had failed. Although the two adults were still in the area, we found that the eyrie was empty. It was too early for the young to have fledged, and the adults no longer exhibited food-provisioning or defensive behavior, so mortality was assumed.

The pair relocated to a new ledge on the cliff and was successful in 2018. By 26 June, two young had fledged and were spending time exploring the clifftop above and south of the eyrie. These were the first Peregrine Falcon young known to fledge from a natural cliff in Maryland in nearly 70 years.

In 2019, the Peregrines were observed in the Narrows copulating and performing other courtship behaviors indicating they were likely to nest on a new ledge toward the middle of the cliff when they abruptly disappeared sometime between 28 March, when both birds were observed by Maryland Department of Natural Resources staff; and 1 April, when M. Olear saw only a brief glimpse of one bird fly over the cliff during a three-hour visit. No Peregrines were observed during a day-long observation on 6 April, and surveys of the Narrows and six potential alternate sites in the vicinity conducted 10 and 11 May failed to locate the pair.

Similarly, in 2020, a pair was observed on 7 March exhibiting courtship behavior and conducting mutual ledge displays on the same ledge toward the middle of the cliff. The adult male was observed during a visit made by another observer on 13 March, but no birds were seen during a five-hour observation conducted by M. Olear on 22 March. Further monitoring of the Narrows in 2020 was curtailed by the COVID-19 pandemic, but a check of the cliff on 21 June failed to find the pair or any indication they had produced or fledged young.

The Peregrine Falcons that are known to have nested in the Narrows since at least 2017 have been documented frequenting the tower of a courthouse in downtown Cumberland during the non-breeding season. Continued observations of Peregrines there in the fall and winter of 2019 and 2020 suggest that a pair may still be in the area and could be nesting at an alternate site.

Observations of a Peregrine pair exhibiting territorial behavior made by a hawk watcher who conducted an autumn count at this site for several years indicate that it may have become reoccupied as early as 2014 (Brian Wargo, pers. comm.).

Marriottsville Quarry

A natural stone and granite quarry on Marriottsville Road in Baltimore County served as a nest site for Peregrine Falcons in 2020. The quarry began operations in the late 1950s and is currently owned by Martin Marietta following the former's acquisition of prior owner Bluegrass Materials in 2018. The rock walls of the quarry serve as an artificial cliff face. Keith Costley (unpubl. data) observed a pair of adults at this quarry on 24 May. M. Olear visited the site the next day and observed an adult female and at least one young in an eyrie toward the top of a high wall at the southern end of the quarry. On 31 May, one young that looked to be approximately 30–32 days old (still down-covered and obviously too young for flight) was observed on ledges below the eyrie, where it continued to be fed and watched over by the adults. It was subsequently observed to have fledged successfully on 13 June.

DISCUSSION

Forty nest sites are known to have been used by Peregrine Falcons since they returned to Maryland as a breeding bird in 1983. Of these, all but three were on artificial, man-made structures, including seven marsh towers, 13 bridges, four buildings, and 13 other structures. Three cliff sites were also used by nesting Peregrines, including two natural cliff faces and one rock quarry. At least 738 young were raised at all of these nest sites over the years.

Marsh towers, bridges, and buildings accounted for nearly 83% of structures used by nesting Peregrine Falcons in the Mid-Atlantic states, including Maryland, in the first 29 years of their reestablishment (Watts et al. 2015). Other types of structures used in the Mid-Atlantic states have included abandoned watermen shacks, water towers, decommissioned military ships, active smokestacks at coal-powered power plants, the smoke box in an old brick chimney in a marsh, and Osprey nests (Watts et al. 2015).

Bridges and towers were the first structures to be used for nesting in Maryland. Use of the towers as nest sites was expected given that the majority of young released in Maryland and surrounding states in the Mid-Atlantic region were

hacked from towers. Prey taken by tower-nesting Peregrines in New Jersey were primarily shorebirds and other migratory species (Steidl et al. 1997). Prey collected between 1992 and 2000 at occupied bay and coastal towers in Maryland, Delaware, and Virginia documented a similar variety of shorebird and migratory bird species (C. Koppie, unpubl. data). Shorebird prey included Lesser Yellowlegs (*Tringa flavipes*), Willet (*Tringa semipalmata*), Ruddy Turnstone (*Arenaria interpres*), Short-billed Dowitcher (*Limnodromus griseus*), and Common Tern (*Sterna hirundo*). Boat-tailed Grackle (*Quiscalus major*) was also regular prey at marsh towers. Interestingly, Bobolink (*Dolichonyx oryzivorus*) was recorded as prey at the second Smith Island tower in 1998, and a Red Knot (*Calidris canutus*) served as prey at South Marsh in 1999.

Marsh towers served as the primary nest sites for Peregrines in Maryland for the first 20 years of nesting following the reestablishment of a breeding population. Over time, as different structures became nest sites and the wooden towers deteriorated, the former hack towers became less important as nest sites in Maryland. Those towers served their main purpose, jump-starting a reestablished breeding population of Peregrine Falcons. Maintenance of the marsh towers has been sporadic at best, with fewer attempts to revisit them each year.

Bridges also became routine nest sites throughout the Mid-Atlantic region following the species' reintroduction. The Chesapeake Bay Bridge was the first bridge to serve as a nest site for Peregrines in the Mid-Atlantic (Watts et al. 2015). In Virginia, Peregrine Falcons were documented nesting on 15 bridges between 1993 and 2016 (Watts and Watts 2017). Nesting success increased with the installation of nest boxes or nest trays on the Virginia bridges. Nest boxes were used on six Maryland bridges and a nest tray was used on a seventh bridge. The most productive bridge in Maryland, the Chesapeake Bay Bridge, had nest boxes to aid in nesting. Although most of the taller bridges on Maryland's Coastal Plain served as nesting sites for Peregrines, there is potential for bridges in the Piedmont and Western Maryland to serve as nest sites as well. The recent use of the railroad bridge across the Monocacy River is a good example.

In addition to bridges, buildings are typically the tallest structures on the Coastal Plain and thus were attractive to Peregrine Falcons as nest sites. Buildings were used by Peregrines as both breeding and wintering sites prior to their extirpation from the eastern United States. During the winter of 1939–1940, a single Peregrine made the top of the United States Post Office Building in Washington, D.C. its home (Denmead 1948). Peregrines wintered regularly on some 20 different New York skyscrapers in midtown and downtown Manhattan (Herbert and Herbert 1965). The first known nesting in that city occurred in 1943 when a pair of Peregrines successfully hatched three young on a ledge of the St. Regis Hotel. A second pair that regularly roosted on the Grand Central Terminal building in winter hatched four clutches of eggs on two different skyscrapers

about 2 km (1 mi) apart in midtown Manhattan. They attempted to nest on several skyscrapers over a ten-year period from 1943 to 1953.

The USF&G Building was the first building in Maryland used by Peregrine Falcons as a nest site and over time became the most productive site in the state. It was also the first building to serve as a nest site in the Mid-Atlantic states (Watts et al. 2015). At least 91 young have been produced at this skyscraper in downtown Baltimore since 1984. As expected for a bird-eating raptor nesting in the heart of a big city, the primary prey of these Peregrines were Rock Pigeons, but a wide variety of other bird species were also taken (Barber and Barber 1983, 1988; Ringler 2016). Barber (1992) even documented prey remains of American Woodcock (*Scolopax minor*) and Northern Saw-whet Owl (*Aegolius acadicus*) at the building. DeMent et al. (1986) found that lead concentrations in Rock Pigeons collected in Baltimore were higher than in those from rural areas and concluded that chronic exposure to low concentrations of lead via consumption of Rock Pigeons was greater for urban Peregrine Falcons than for Peregrines feeding on Rock Pigeons in rural areas. However, they concluded that the increase in exposure of Peregrines to lead did not appear to be significant at approximately 4.60 ppm/Rock Pigeon/day.

The most frequent prey species found in urban and Piedmont nest sites in the Delmarva region included Yellow-billed Cuckoo (*Coccyzus americanus*), Red-winged Blackbird (*Agelaius phoeniceus*), Common Grackle (*Quiscalus quiscula*), Blue Jay (*Cyanocitta cristata*), Mourning Dove (*Zenaida macroura*), Northern Cardinal (*Cardinalis cardinalis*), Cedar Waxwing *(Bombycilla cedrorum*), Northern Flicker (*Colaptes auratus*), Baltimore Oriole (*Icterus galbula*), Common Nighthawk (*Chordeiles minor*), Green Heron (*Butorides virescens*), Rock Pigeon, and European Starling (*Sturnus vulgaris*) (C. Koppie, unpubl. data). Blue Jay feathers were common at the Chesapeake Bay Bridge nest box when C. Koppie and G. Therres went to band the young Peregrines.

Tall buildings and other man-made structures may facilitate expansion of the breeding population into the Piedmont and mountains of Maryland, as evidenced by the use of the Lehigh Cement Plant in Carroll County.

While only two power plants in Maryland are known to have been used as nest sites by Peregrine Falcons, there is greater potential of these sites to be occupied by the species in the future. In the midwestern United States, Peregrines nested at six power plants in 1993, and another three were occupied by adult pairs during the nesting season (Septon et al. 1996). Nest boxes were used by the pairs at these power plants. In Wisconsin, 222 young Peregrines were produced at ten power plants from 1992 through 2004 (Septon 2004).

The other man-made structures used as nest sites in Maryland were relatively tall structures in close proximity to large bodies of open water. Exceptions were

the Lehigh Cement Plant, Hilton DoubleTree Hotel, and Roland Park Water Tower. It is likely that abundant populations of Rock Pigeons near those sites probably sustained the Peregrines through the nesting season.

Although only two Osprey nests in Maryland are known to have been used by nesting Peregrine Falcons, one on a channel marker and the other atop the end of a bridge support beam, the potential for more is great. Watts et al. (2015) predicted that moderate use of the thousands of Osprey nests in the area would be difficult to monitor, but has tremendous potential.

Over the past 38 years, Peregrine Falcons have nested in half the counties in Maryland and in Baltimore City. They started on the Coastal Plain and eventually moved onto the Piedmont and then into the mountains of Western Maryland.

The return of nesting Peregrines to the last known eyrie used in Maryland before their population crashed in the eastern United States in the 1950s was the ultimate success of the reintroduction efforts. The reoccupation of Maryland Heights in 2015 marked the first time in more than 60 years that Peregrines were known to nest at a natural cliff in Maryland. Maryland's first cliff-nesting Peregrine Falcons came 35 years after the first cliff nest was confirmed in the eastern United States after reintroduction efforts began. By 1985, there were five successful cliff nesting attempts in New York, Vermont, and New Hampshire that produced 13 young (Barclay 1988). That same year, ten young were produced at three coastal nest sites in Maryland.

Eleven nest sites in Maryland and along the Potomac River were documented to have been used by Peregrines prior to the species' extirpation in the mid-twentieth century (M. Olear, unpubl. data). Eight of those sites occurred in Maryland, and several of those, such as Point of Rocks and Seneca, were low, easily accessible cliffs of marginal quality that were likely abandoned or only occupied sporadically even by the late 1930s or early 1940s, prior to widespread DDT use. The primary deterrents to the reoccupation of natural cliffs in Maryland by Peregrines are the scarcity of high-quality cliffs in the state and the amount of human activity that occurs at the few sites that exist.

The two natural cliffs in the state that currently may be the most suitable for use by Peregrine Falcons, Maryland Heights and the Cumberland Narrows, have become reoccupied. However, both receive considerable use by hikers and rock climbers, particularly the former site. Partial, seasonal closures of the cliff faces and clifftop overlooks were instituted in both locations, but they are difficult to monitor and enforce, particularly at the Narrows. However, the continued recolonization of natural cliffs throughout the surrounding region, including a successful nesting recently documented at another historic site along the North

Branch of the Potomac in West Virginia, suggests that those sites in Maryland that are still suitable may eventually become reoccupied.

Also, the recent use of a rock quarry by nesting Peregrines suggests other quarries in Maryland may serve as nest sites in the near future. In Ireland, Moore et al. (1997) estimated that 65 quarries were occupied by Peregrines in the early 1990s. M. Olear (unpubl. data) has identified 20 quarries in Maryland that could potentially serve as nest sites for Peregrine Falcons.

CONCLUSIONS

Since the Peregrine Falcon began nesting again in Maryland following its reintroduction, four times as many nest sites have been used by this species as were documented historically. The reestablished breeding population has primarily utilized man-made structures and only recently began reoccupying the natural cliffs where they nested historically. Recent trends for the breeding Peregrine Falcon population in Maryland show nesting occurs more regularly in coastal areas than in the mountains and much more frequently in urban areas. Many of these nontraditional nest sites are highly productive. As we have encountered over these many years, conflicts arise when Peregrines nest on man-made structures, necessitating the adjustment of maintenance schedules and other work to mitigate disturbance to nesting Peregrine Falcons during the breeding season and for human safety concerns. Transportation projects for example, require regulatory compliance of federal and state mandates to ensure integrity of highway and bridge structures are maintained and improved for public safety. Maintenance contracts and scheduling of projects often coincide with the breeding season of bridge-nesting Peregrines, which has led to nest disturbance. Proactive management measures aimed to minimize long-term impacts to nesting Peregrine Falcons will be an integral strategy necessary to sustain this portion of the population. Given the adaptability of Peregrines to the use of different types of nest sites, there is a nearly unlimited number of potential breeding sites in Maryland to enable the population to increase. The reoccupation of historic cliff sites for nesting by Peregrines is encouraging. Though limited in numbers, more cliffs and quarries will hopefully be used as nest sites in the future. The outlook for nesting Peregrine Falcons in Maryland appears secure given the bird's adaptability and the variety of nest sites they are capable of utilizing.

ACKNOWLEDGMENTS

Thanks are extended to those folks who helped monitor nest sites for many years, especially John Barber, Steve Dawson, Brad Eby, Dan Haas, Russ Hill, Bill McInturf, Wally King, Kyle Rambo, Bill Hebb, Todd Keller, Cheri Peifer, Kenneth Rineker, Bill Dugan, Milton Thacker, Paul Taylorson, Bob Allen, Peter McGowan, Randy Loftus, and others who reported nesting activities and to those who first discovered the sites. Some records were obtained from eBird,

hosted by the Cornell Lab of Ornithology. Thanks are extended to the property owners of the nest sites for tolerating the Peregrines nesting on their properties and for allowing us access to monitor them. The Maryland Transportation Authority was extremely cooperative and provided us safe access to the bridge nest sites under their jurisdiction. David Johnston (Department of Biology, George Mason University, Fairfax, Virginia) assisted with identification of prey remains collected at nest sites. Thanks to Lynn Davidson (Program Manager, Conservation Technology, Wildlife and Heritage Service, Maryland Department of Natural Resources, Annapolis, Maryland) for producing the map of nest sites. The nest monitoring efforts were funded, in part, by federal endangered species funds and Wildlife Restoration grants to the Maryland Department of Natural Resources, state Wildlife Management and Protection Funds, and donations to the Chesapeake Bay and Endangered Species Fund by Maryland taxpayers. Thanks are extended to two anonymous reviewers who provided helpful suggestions for improving an earlier version of the manuscript.

LITERATURE CITED

Barber, J.C. 1992. Unusual prey of urban Peregrine Falcons. *Maryland Birdlife* 48(2):74.

Barber, J.C., and M.M. Barber. 1983. Prey of an urban Peregrine Falcon. *Maryland Birdlife* 39(4):108–110.

Barber, J.C., and M.M. Barber. 1988. Prey of an urban Peregrine Falcon – Part II. *Maryland Birdlife* 44(2):37–39.

Barclay, J. H. 1988. Peregrine restoration in the eastern United States. Pages 549–558 in: *Peregrine Falcon Populations: Their management and recovery*, T.J. Cade, J.H. Enderson, C.G. Thelander, and C.M. White (Editors). The Peregrine Fund, Inc., Boise, Idaho. 949 pp.

Barclay, J.H., and T.J. Cade. 1983. Restoration of the Peregrine Falcon in the eastern United States. Pages 3–37 in: *Bird Conservation 1*, S.A. Temple (Editor), The International Council for Bird Preservation, United States Section. The University of Wisconsin Press, Madison, WI. 156 pp.

Clark, K.E., Y. Zhao, and C.M. Kane. 2009. Organochlorine pesticides, PCBs, dioxins, and metals in postterm Peregrine Falcon (*Falco peregrinus*) eggs from the Mid-Atlantic states, 1993–1999. *Archives of Environmental Contamination and Toxicology* 57(1):174–184.

DeMent, S.H., J.J. Chisolm, Jr., J.C. Barber, and J.D. Strandberg. 1986. Lead exposure in an "urban" Peregrine Falcon and its avian prey. *Journal of Wildlife Diseases* 22(2):238–244.

Denmead, T. 1948. To a Duck Hawk. *Maryland Conservationist* 25(3):22–23.

Enderson, J.H., W. Heinrich, L. Kiff, and C.M. White. 1995. Population changes in North American Peregrines. Pages 142–161 in: *Transactions of the Sixtieth North American Wildlife and Natural Resources Conference, 24–29 March 1995, Minneapolis, MN.*

Faccio, S.D., M. Amaral, C.J. Martin, J.D. Lloyd, T.W. French, and A. Tur. 2013. Movement patterns, natal dispersal, and survival of Peregrine Falcons banded in New England. *Journal of Raptor Research* 47(3):246–261.

Gahbauer, M.A., D.M. Bird, K.E. Clark, T. French, D.W. Brauning, and F.A. McMorris. 2015. Productivity, mortality, and management of urban Peregrine Falcons in northeastern North America. *The Journal of Wildlife Management* 79(1):10–19.

Herbert, R.A., and K.G.S. Herbert. 1965. Behavior of Peregrine Falcons in the New York City region. *The Auk* 82(1):62–94.

Hickey, J.J. (Editor). 1969. *Peregrine Falcon Populations: Their biology and decline.* University of Wisconsin Press, Madison, WI. 596 pp.

Moore, N.P., P.F. Kelly, F.A. Lang, J.M. Lynch, and S.D. Langton. 1997. The Peregrine *Falco peregrinus* in quarries: current status and factors influencing occupancy in the Republic of Ireland. *Bird Study* 44(2):176–181.

Palmer, R.S. (Editor). 1988. *Handbook of North American Birds, Volume 5, Diurnal Raptors, Part 2.* Yale University Press, New Haven, CT and London, UK. 465 pp.

Ringler, R.F. 2016. Peregrine Falcon (*Falco peregrinus*) prey items found outside a state office building complex in Baltimore, Maryland, August 1982 to March 1983. *Maryland Birdlife* 65(2):4–9.

Robbins, C.S. (Senior Editor), and E.A.T. Blom (Project Coordinator). 1996. *Atlas of the Breeding Birds of Maryland and the District of Columbia.* University of Pittsburgh Press, Pittsburgh, PA. 479 pp.

Septon, G. 2004. Peregrine Falcons and electric power plants in Wisconsin. *The Passenger Pigeon* 66(3):187–193.

Septon, G.A., J. Bielefeldt, T. Ellestad, J.B. Marks, and R.N. Rosenfield. 1996. Peregrine Falcons: power plant nest structures and shoreline movements. Pages 145–153 in: *Raptors in Human Landscapes: Adaptations to built and cultivated environments*, D.M. Bird, D.E. Varland, and J.J. Negro, (Editors). Academic Press, New York, NY. 396 pp.

Steenhof, K., M.N. Kochert, C.L. McIntyre, and J.L. Brown. 2017. Coming to terms about describing Golden Eagle reproduction. *Journal of Raptor Research* 51(3):378–390.

Steidl, R.J., C.R. Griffin, T.P. Augspurger, D.W. Sparks, and L.J. Niles. 1997. Prey of Peregrine Falcons from the New Jersey coast and associated contaminant levels. *Northeast Wildlife* 52:11–19.

Stewart, R.E., and C.S. Robbins. 1958. *Birds of Maryland and the District of Columbia*. North American Fauna 62. United States Department of the Interior, Fish and Wildlife Service. 401 pp.

Therres, G.D. 1996a. Breeding biology of Peregrine Falcons nesting on Maryland's Coastal Plain. *Maryland Birdlife* 52(2):47–51.

Therres, G.D. 1996b. Peregrine Falcon, *Falco peregrinus*. Pages 112–113 in: *Atlas of the Breeding Birds of Maryland and the District of Columbia*. C.S. Robbins (Senior Editor) and E.A.T. Blom (Project Coordinator). 1996. University of Pittsburgh Press, Pittsburgh, PA. 479 pp.

Therres, G.D., S. Dawson, and J.C. Barber. 1993. *Peregrine Falcon Restoration in Maryland*. Maryland Department of Natural Resources, Fish, Heritage and Wildlife Administration, Wildlife Technical Publication 93-1, Annapolis, MD. 24 pp.

USF&WS (United States Fish and Wildlife Service). 1970. Part 17 – Conservation of endangered species and other fish or wildlife. *Federal Register* 35(106):8491–8498.

USF&WS (United States Fish and Wildlife Service). 1999. Final rule to remove the American Peregrine Falcon from the federal list of endangered and threatened wildlife, and to remove the similarity of appearance provision for free-flying Peregrines in the conterminous United States. *Federal Register* 64(164):46542–46558.

Watts, B.D., and M.U. Watts. 2017. *Investigation of Breeding Peregrine Falcons on Bridges*. The Center for Conservation Biology, Technical Report Series, CCBTR-17-01. College of William and Mary & Virginia Commonwealth University, Williamsburg, VA. 38 pp.

Watts, B.D., K.E. Clark, C.A. Koppie, G.D. Therres, M.A. Byrd, and K.A. Bennett. 2015. Establishment and growth of the Peregrine Falcon breeding population within the Mid-Atlantic Coastal Plain. *Journal of Raptor Research* 49(4):359–366.

Wimsatt, W.A. 1939. Black Vulture and Duck Hawk nesting in Maryland. *The Auk* 56(2):181–182.

Wimsatt, W.A. 1940. Early nesting of the Duck Hawk in Maryland. *The Auk* 57(1):109.

Maryland Birdlife 70(2):71–74

A White-Throated Sparrow, *Zonotrichia albicollis*, with Probable 'Progressive Graying'

W. Scott Young[1] and Lynn H. Gregg[2]

[1]*11116 Pinion Court, Gaithersburg, Maryland 20878-2565;*
wsyacy@verizon.net
[2]*Woodstock, Maryland;*
lhg5037@gmail.com

A nearly white sparrow was photographed by one of the authors (LHG) on 19 February 2021 in the yard of a private residence in Ellicott City, Howard County, Maryland. It would often feed on seeds in the grass below a feeder and was seen occasionally in trees before departing after a few days. We are certain that this is a White-throated Sparrow (*Zonotrichia albicollis*) based on the stocky shape and relatively long tail. The yellow supraloral stripes are also consistent with this species (Figure 1). We consider less likely the Savannah Sparrow (*Passerculus sandwichensis*) which may also have a similar yellow marking but has a shorter tail and a more gradually sloping forehead than this bird. The White-throated Sparrow is also much more likely than the Savannah Sparrow to be seen in backyards underneath feeders with other birds (Sibley 2016).

The color patterning of this bird also presents a diagnostic puzzle. We have relied heavily on the writings of van Grouw (2013, 2018) to aid us in our assessment. One often misused coloration disorder is 'albinism' which involves the absence of the enzyme, tyrosinase, essential for the formation of the brown and black melanins. As a result of this genetic deficit in all epidermal and dermal cells, there would be no brown or black feathers at all as are present in the observed bird. Furthermore, the eyes would be pink or red. The mutation 'ino - light' is also eliminated because of this bird's generally remaining dark feathers and dark eyes (although photographs are not necessarily definitive on the latter, e.g., see Figures 26 and 27 in van Grouw 2013). We also do not think that this bird suffers from the 'brown' mutation as there are still very dark feathers that would have become brown and the phaeomelanin would have remained leaving more brown areas as opposed to the striking abundance of white feathers. Also, a phenotype not yet mentioned, the pink bill, steers us away from the 'brown' mutation. An interesting condition known as 'dilution' was considered but eliminated due to the whiteness of the affected feathers and remaining dark feathers (see Morrow and Morrow 2020 for an example of dilution in a White-throated Sparrow).

Figure 1. White-throated Sparrow, *Zonotrichia albicollis*, with 'progressive graying'. Top: right lateral view; middle: frontal view; bottom: left lateral view. Red and blue asterisks indicate pigmented feathers present on the right side, but not on the left side. Photos by LHG.

This leaves two more likely candidates: either the bird is 'partially leucistic' or has 'progressive graying'. Both defects could lead to the abundance of white feathers seen in this bird. Both would leave the dark eye pigment (melanin) and the yellow (carotenoid) supraloral color unaffected. Both could pinken the bill and feet (although White-throated Sparrows have pink feet). As a remaining patch of dark feathers is present on the right mantle (Figure 1: top and middle panels: red asterisk) and another on the right primaries only (Figure 1: top panel: blue asterisk; bottom panel shows the absence of dark feathers on the left side), we decided on probable 'progressive graying' due to the evidence for increased randomness of the remaining color and because 'progressive graying' is much more common than 'leucism' (van Grouw 2013, 2018). In the absence of historical pictures of this sparrow, we cannot arrive at a definitive conclusion based on the melanin-colored feathers. This is similar to the case of a pied Chipping Sparrow, *Spizella passerina*, that one of us (WSY) discussed recently (Young 2021). However, photos of this White-throated Sparrow show some tan or faint yellow coloring on the coverts and perhaps the sides (Figure 1, all panels), consistent with the pale-yellow edge of the wing that is present in formative plumage August through March of the first year of life (Figure 2) (Falls and Kopachena 2020). As 'leucism' would not spare the yellow, this strengthens the likelihood of 'progressive graying'. Of historical note, the article by Falls and Kopachena (2020) includes a number of references to white-hooded White-throated Sparrows dating to 1876; however, they lack adequate descriptions or figures to diagnose the discolorations.

These observations and comparisons with other color disorders are summarized in Table 1. The reader interested in more information on the fundamental etiologies of 'progressive graying' and other pigment abnormalities is referred to van Grouw (2013, 2018) and Young (2021).

Figure 2. Normal White-throated Sparrows demonstrating apparent yellowish carotenoid-containing feathers on the primary and marginal coverts (red arrows) of formative plumage. Photos by WSY.

Table 1. Characteristics of some plumage disorders resulting in reduced coloration. (after van Grouw 2013, 2018).

	Physical Characteristic			
Color Aberration	**Brown and Black Feathers (melanins)**	**Yellow/Orange/Red Feathers (carotenoids)**	**Eyes**	**Bill/Feet**
The current subject	white with asymmetric black patches; tan side	normal	dark	pink
Albinism	white	normal	pink	pink
Leucism	white patches; symmetrical and static	normal	normal	normal or pink
Progressive graying	white patches; asymmetric and progressive	normal	normal	normal or pink
Brown	white to tan; static; females	normal	normal	slightly paler
Ino - light	some pigment remains but may fade; females	normal	red	pink
Dilution	silvery-gray but with reddish/tan if pheomelanin not affected	normal	normal	normal

ACKNOWLEDGMENTS

We are extremely grateful to Hein van Grouw for reading and commenting on an early version of the manuscript. We also appreciate the expert editing of Eugene J. Scarpulla and Mark S. Johnson, as well as the former's reference to the formative plumage.

LITERATURE CITED

Falls, J.B., and J.G. Kopachena. 2020. White-throated Sparrow (*Zonotrichia albicollis*), version 1.0. Last updated 21 May 2010. In Birds of the World (A.F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY. Available at: https://doi.org/10.2173/bow.whtspa.01. Accessed 19 July 2021.

Morrow, J., and L. Morrow. 2020. White-throated Sparrow (*Zonotrichia albicollis*) with dilute pastel plumage. *Maryland Birdlife* 69(2):8–12.

Sibley, D.A. 2016. *Sibley Birds East* (second edition). Alfred A. Knopf, New York, NY. 466 pp.

van Grouw, H. 2013. What colour is that bird? The causes and recognition of common colour aberrations in birds. *British Birds* 106:17–29.

van Grouw, H. 2018. White feathers in black birds. *British Birds* 111:250–263.

Young W.S. 2021. A Chipping Sparrow, *Spizella passerina*, with probable 'progressive graying'. *Maryland Birdlife* 70(1):58–61.

Maryland Birdlife 70(2):75–88

Maryland Christmas Bird Counts (121st CBC) December 2020 through January 2021

John B. (J.B.) Churchill

119 Bar Harbor Road, Pasadena, Maryland 21122; jchurchi@gmail.com

Twenty-five counts took place in Maryland this year, one more than last year since Middle River was active again (Table 1). The minimum low temperature at any count was 10 °F (-12 °C) at Catoctin Mountain. The minimum high was 29 °F (-2 °C) at Rock Run. The highest low temperature was 42 °F (6 °C) and the highest high temperature was 54 °F (12 °C), both from Ocean City. Maximum snow depth was 6–10 in (15–25 cm) on 19 December 2020 for the Oakland Count in Western Maryland. Point Lookout was the only count listing snow precipitation during the count (on the morning of 3 January 2021). Twelve out of the 25 Maryland counts had rain at some point during the day.

Table 1. 2020–2021 Maryland Christmas Bird Counts: count names, survey dates, and compilers (primary compilers listed first).

Christmas Bird Count	Survey Date	Compilers
Allegany County	19 DEC 2020	Mark Eanes
Catoctin Mountain	19 DEC 2020	Kathy Brown
Denton	19 DEC 2020	Steve Westre
Oakland	19 DEC 2020	Connie Skipper
Triadelphia Reservoir	19 DEC 2020	David Holmes
Washington County	19 DEC 2020	Mark Abdy
Elkton	20 DEC 2020	Russ Kovach
Jug Bay	20 DEC 2020	Marcia Watson
Lower Kent County	20 DEC 2020	Nancy Martin, Walter Ellison
Middle River	20 DEC 2020	Libby Erickson, Joe Corcoran
Port Tobacco	20 DEC 2020	Mike Callahan
Salisbury	20 DEC 2020	Mike Walsh
Seneca	20 DEC 2020	Jim Nelson
St. Michaels	20 DEC 2020	Wayne Bell
Rock Run	26 DEC 2020	Mark Johnson
Chesterville	27 DEC 2020	Maren Gimpel
Crisfield	27 DEC 2020	Paul Bystrak
Patuxent River	27 DEC 2020	Andrew Brown
Southern Dorchester County	27 DEC 2020	Bruce Peterjohn
Ocean City	28 DEC 2020	Mark Hoffman
Bowie	01 JAN 2021	Dave Mozurkewich
Annapolis-Gibson Island	03 JAN 2021	Hal Wierenga, Lynn Davidson, Sue Ricciardi
Point Lookout	03 JAN 2021	Bob Boxwell
Sugarloaf Mountain	03 JAN 2021	Janet Millenson
Loch Raven	05 JAN 2021	Libby Erickson, Joe Corcoran

Table 2 summarizes the the numbers of field counters, parties, party hours and miles, feeder counters and hours, and night hours and miles.

Table 2. 2020–2021 Maryland Christmas Bird Counts: summary.

Christmas Bird Count	Survey Date	Field Counters	Maximum Parties	Party Hours	Party Miles	Feeder Counters	Feeder Hours	Night Hours	Night Miles
Allegany County	19 DEC 2020	14	10	46.5	148	0	0	1.5	0
Catoctin Mountain	19 DEC 2020	29	17	83.6	434.1	1	1	1.5	6.25
Denton	19 DEC 2020	13	13	69	370	0	0	6.7	69.1
Oakland	19 DEC 2020	17	12	80.5	365.63	1	1.5	1.75	8.5
Triadelphia Reservoir	19 DEC 2020	70	41	195.1	503.85	5	9.25	3.5	9.5
Washington County	19 DEC 2020	18	13	56	269.5	4	15	1.5	1.75
Elkton	20 DEC 2020	14	8	54.16	286.91	0	0	2.1	11.8
Jug Bay	20 DEC 2020	44	30	162.7	457.7	3	11.3	3.5	5.9
Lower Kent County	20 DEC 2020	21	11	103.25	285.5	2	2	8.75	27
Middle River	20 DEC 2020	34	21	90.7	276.8	2	2	2	6
Port Tobacco	20 DEC 2020	27	13	80.6	231.9	0	0	2	0
Salisbury	20 DEC 2020	20	11	83.5	322.2	0	0	5.75	34
Seneca	20 DEC 2020	132	65	275.25	455.45	23	45.75	0	0
St. Michaels	20 DEC 2020	51	22	144.1	342.4	3	6	19.1	82.7
Rock Run	26 DEC 2020	49	14	113	400.15	2	7.5	9.4	50
Chesterville	27 DEC 2020	25	13	146.5	514.62	0	0	12	53.5
Crisfield	27 DEC 2020	21	13	89.5	185.25	0	0	6.5	17.25
Patuxent River	27 DEC 2020	24	17	84.25	364.64	3	7	5	3.5
Southern Dorchester County	27 DEC 2020	13	10	88.25	247.5	0	0	10.75	30.5
Ocean City	28 DEC 2020	48	27	213.9	493.9	0	0	10.6	54.4
Bowie	01 JAN 2021	75	51	287.5	569.8	7	30	9.75	43.7
Annapolis-Gibson Island	03 JAN 2021	68	52	265	633	21	60	6	13
Point Lookout	03 JAN 2021	14	14	65.35	230	2	2	1.75	3.9
Sugarloaf Mountain	03 JAN 2021	64	38	125	386.5	11	23.5	1	0.5
Loch Raven	05 JAN 2021	29	21	272.3	214.09	2	3.75	1	0.5

Avian highlights this year include 3 King Eider, the returning Barrow's Goldeneye, and an Eared Grebe. Most spectacular were a Western Grebe and a Western/Clark's Grebe (not officially determined) at Loch Raven Reservoir. Both Ruby-throated and Rufous Hummingbirds made appearances. A few interesting Warblers were found including a Yellow-throated, and a Black-and-White Warbler. It was a good year for the winter finches with numbers of Red Crossbill and Evening Grosbeak reports, and a Common Redpoll here or there with regular pushes of Pine Siskins and Purple Finches.

The following are some of the highlights from this year's report (bold species names = the most significant sightings across all counts statewide, hc = high count, lc = low count, us = unusual for the count, and cw = count week). The complete list can be found in Tables 3 and 4.

Waterfowl: Lower Kent County had 3, and Seneca had a single Ross's Goose (us); Triadelphia Reservoir had 8 (which is not an all-time hc). Lower Kent County had 6 Greater White-fronted Geese (hc; 3 separate pairs); Bowie had 4 (hc, us) and St. Michaels had 3 (hc). Lower Kent County had 29 Cackling Geese (also not an all-time high but close to their hc of 34); Jug Bay had 6; Elkton had 5 (both hc); Rock Run, Seneca, and Southern Dorchester County each had 3; Chesterville, Oakland, and Patuxent River each had 2; Annapolis-Gibson Island, Bowie, Denton, Point Lookout, and Sugarloaf Mountain each had 1. Bowie had 15,656 Canada Geese (close to their all-time high of 16,044). Lower Kent County had a Snow x Canada Goose hybrid. Trumpeter Swans have been showing up on several counts in recent years. This year, Jug Bay had 10 (hc), Southern Dorchester County had 4, Bowie had 3, Loch Raven had 1. Patuxent River had 27 Tundra Swans (which is low for that count). Ocean City had an all-time high of 75 Wood Ducks and 54 at Southern Dorchester County was also a high number but not an all-time hc. Bowie had 2 Blue-winged Teal (us for this count). Southern Dorchester County had 275 Northern Shovelers (hc) and Annapolis-Gibson Island had 29 (hc). Ocean City had 362 Gadwall (near hc; record all-time high is 407 from the 115th CBC). Bowie and Seneca each had 60 Gadwall (hc). Rock Run had 232 Redheads (hc). Southern Dorchester County had higher than usual numbers of Ring-necked Ducks (461) though this was not an all-time hc; Jug Bay had 233 (hc). Oakland had 14 Greater Scaup (hc). The Loch Raven count had a Redhead x Scaup hybrid. Ocean City had 3 **King Eider** (us). Oakland had 2 White-winged Scoters and 5 Long-tailed Ducks (hc for both those species). Lower Kent County had 246 Surf Scoters (hc). Oakland had 206 Bufflehead, and Washington County had 7 (hc). Chesterville had a low count of only 1 Bufflehead. Common Goldeneye numbers were down at Patuxent River (42). Point Lookout had a **Barrow's Goldeneye** again (cw). Bowie had 254 Hooded Mergansers (hc) and Southern Dorchester County had 148 (high numbers but not an all-time hc). Chesterville had 648 Common Mergansers, and Oakland had 107 (both hc). Triadelphia Reservoir had 13 Red-breasted Mergansers (hc). Rock Run had 4,253 Ruddy Ducks (hc) while a count of 290 was an all-time low for the Patuxent River count (lc).

Turkey and Quail: Bowie had 62 Wild Turkey (hc); Point Lookout had 61 (hc).

Grebes: Patuxent River had 9 Pied-billed Grebes (hc). Loch Raven had a Red-necked Grebe (relatively unusual species). St. Michaels had an **Eared Grebe** (cw). Loch Raven had a **Western Grebe** and a possible hybrid **Western x Clark's Grebe** (Figure 1).

Figure 1. Left: Western Grebe (*Aechmophorus occidentalis*) and Right: possible hybrid Western/Clark's Grebe (*A. occidentalis/clarkii*). Loch Raven Christmas Bird Count; Loch Raven Reservoir, Baltimore County, Maryland; 5 January 2021; photos by Don Burggraf.

Doves and Hummingbirds: Ocean City had a **Ruby-throated Hummingbird** (us; 4th occurrence) and Port Tobacco had a **Rufous Hummingbird**.

Rails and Cranes: Jug Bay had 14 Virginia Rails (hc). St. Michaels and Southern Dorchester County each had a Sora (relatively unusual species). Catoctin Mountain had 40, Middle River had 58 (hc), and Seneca had 2 Sandhill Cranes.

Shorebirds: St. Michaels had an **American Avocet** (cw). Ocean City had 2 **Semipalmated Plover** (us). At Ocean City, 7 Ruddy Turnstones was low (though the species has been missed historically). Jug Bay had a Purple Sandpiper (cw). Ocean City had 5,502 Dunlin (hc).

Gulls and Terns: Port Tobacco had 125 Laughing Gulls (hc). St. Michaels had an Iceland Gull (the count's first ever). Rock Run had 2 Glaucous Gulls (hc). Patuxent River had 639 Great Black-backed Gulls (hc). Ocean City had 421 Forster's Terns (high but not all-time hc which was 1,100 from the 102th CBC). They also had 7 **Royal Terns** (hc and us; 4th occurrence).

Loons, Gannets, Pelicans, and Herons: Patuxent River had 9 Great Cormorants (hc) and 1,840 Double-crested Cormorants (hc). Lower Kent County had 1,655 Double-crested Cormorants (hc); Ocean City had 171 (hc). Ocean City had 66 American White Pelicans (hc) and Southern Dorchester County continues to get them as well (only 1 on this year's count); Patuxent River had 121 (near hc). Patuxent River had a **white morph Great Blue Heron** (**"Great White Heron"**) (cw). Lower Kent County had 2 Great Egrets (us and hc) and Middle River also had 2 (us). Ocean City had 2 Green Herons (us - hc).

Vultures, Hawks, and Eagles: Chesterville had 374 Black Vultures (hc). Southern Dorchester County had 161 (all time hc). Patuxent River was the only count to have an Osprey (us). Lower Kent County and Southern Dorchester County each had a Golden Eagle. Triadelphia Reservoir had 21 Northern Harriers (hc). Chesterville had 17, Sugarloaf Mountain had 11, and Patuxent River had 5 Cooper's Hawks (all all-time hc). Seneca had 18 Cooper's Hawks (near to the high of 19 in the 110th CBC). Crisfield had 143 Bald Eagles (hc). Red-shouldered Hawks were all-time highs for several counts (Triadelphia Reservoir had 89, Rock Run had 32, Port Tobacco had 31, Catoctin Mountain had 30, Chesterville had 27, Ocean City had 21, and Elkton had 13).

Owls: Bowie had 10 Great-horned Owls (the all-time high is 25 but 10 is still good). Southern Dorchester County had 9 Barred Owls (hc). Ocean City had 5 (hc) and Bowie had a single Northern Saw-whet Owl (us).

Woodpeckers: Bowie had 88 Yellow-bellied Sapsuckers (not quite their all-time of 94 but still a very good number); Triadelphia Reservoir had 57, Patuxent River had 41, Elkton and Washington County each had 25, and Crisfield had 22 (all hc). Chesterville had 88 Downy Woodpeckers (hc). Bowie had 88 (near the all-time of 90) and Chesterville had 27 Pileated Woodpeckers (hc).

Falcons: Triadelphia Reservoir had 6 Merlin (hc), Catoctin Mountain and Jug Bay each had 1 (us). Bowie also had a Merlin (cw). Crisfield had 3 Peregrine Falcons (hc), Bowie had 2, and Jug Bay had 1 (us).

Flycatchers, Shrikes, and Corvids: Crisfield had 22 Eastern Phoebes (very close to the all-time high of 23). Crisfield had a **White-eyed Vireo** (us). Chesterville had 190 American Crows (hc). Seneca had 19, Triadelphia Reservoir had 16, Washington County had 8, and Jug Bay had 4 Common Ravens (all hc).

Chickadees, Nuthatches, and Creeper: Washington County had 594 Horned Larks (hc). Southern Dorchester County had 144 Tree Swallows (not an all-time high, but good numbers). St. Michaels had 170 Red-breasted Nuthatches (hc). Crisfield had 13 White-breasted Nuthatches (hc). Point Lookout had 660 Brown-headed Nuthatches (hc) and Southern Dorchester County had 231 (high numbers but not an all-time high). Seneca had a **Blue-gray Gnatcatcher** (us).

Wrens: Seneca had 3 House Wrens (hc). St. Michaels had 17 Winter Wrens (near to the hc of 19). Sugarloaf Mountain had 478, Chesterville had 282, and Jug Bay had 407 Carolina Wrens (all hc). Annapolis-Gibson Island had 611 Carolina Wrens (a high number for the count; all-time hc was 683).

Thrushes, Mimids, and Pipits: Bowie had 18 Gray Catbirds (near the all-time high of 22); Washington County had 3 (hc). Bowie had 24 Brown Thrashers

(hc). Bowie had 167 Hermit Thrushes (all-time high is 168); Triadelphia Reservoir had 78 (hc), and Catoctin Mountain had 11 (hc). Catoctin Mountain had 1,649 American Robins (hc). Lower Kent County had 523, Seneca had 426, and Triadelphia Reservoir had 359 American Pipits (all hc).

Finches: Washington County had 30 House Finches (lc). Southern Dorchester County had only 2 House Finches (low but not all-time low). Seneca had 22 Common Redpolls (hc) while Triadelphia Reservoir had 1, and Oakland had one for count week. Red Crossbills were counted at six counts: Bowie (1), Jug Bay (cw), Lower Kent County (1), Ocean City (3), Point Lookout (8), and Southern Dorchester County (5). Pine Siskins occurred at 24 out of 25 Maryland Counts. Lapland Longspurs occurred on six Maryland Counts; Catoctin Mountain (1), Chesterville (2), Jug Bay (2), Point Lookout (cw), Rock Run (cw), Seneca (cw). Seneca had a Snow Bunting.

Sparrows: Triadelphia Reservoir had 43 Chipping Sparrows (hc). Ocean City and Sugarloaf Mountain each had 1 **Clay-colored Sparrow** (us). Triadelphia Reservoir had 3,659 Dark-eyed Juncos and Catoctin Mountain had 1,715 (both hc). Lower Kent County had only 3 White-crowned Sparrows (lc). Chesterville had 382 White-crowned Sparrows (hc) including a single **Gambel's** subspecies. Bowie had 5,172 White-throated Sparrows (not all-time; hc was 6,139). Triadelphia Reservoir had 4,070, Sugarloaf Mountain had 2,517, Catoctin Mountain had 1,682, and Allegany County had 453 White-throated Sparrows (all hc). Southern Dorchester County had only 71 White-throated Sparrows (lc). Jug Bay had a Vesper Sparrow (us). Sugarloaf Mountain had 31 Savannah Sparrows (hc). Oakland had 6 Savannah Sparrows (us). Chesterville had 1,228 Song Sparrows (hc). Bowie and Oakland each had 1 **Lincoln's Sparrow** (us) and Ocean City had 2 (all hc). Lower Kent County had 436, Bowie had 335, Chesterville had 206, and Patuxent River had 52 Swamp Sparrows (all hc).

Chat, Blackbirds, and Orioles: Triadelphia Reservoir had a single **Baltimore Oriole** (us; their seventh) and Denton had one for count week (us). Southern Dorchester County had 68 Common Grackles (both counts were fewer than typical).

Warblers: Annapolis-Gibson Island had a **Black-and-White Warbler** (us). Ocean City had 6 Orange-crowned Warblers (hc) and Bowie had 1 Orange-crowned Warbler (us). Annapolis-Gibson Island had an Orange-crowned Warbler for count week. Southern Dorchester County had 18 Palm Warblers (hc). Patuxent River had 3 Palm Warblers (hc). Ocean City had a **Yellow-throated Warbler** (us). Bowie had only 12 Yellow-rumped Warblers (low; near to the all-time lc of 4).

Table 3. 2020–2021 Maryland Christmas Bird Counts: Inland counts.
(bolded species name = unusual for the Maryland counts; bolded number = high count record; cw = count week; lc = low count)

Species	Oakland	Allegany County	Washington County	Catoctin Mountain	Sugarloaf Mountain	Seneca	Triadelphia Reservoir	Loch Raven	Rock Run	Bowie	Elkton	Chesterville
Snow Goose	1						1		cw		4	12,809
Ross's Goose						1						
Greater White-fronted Goose										**4**		
domestic goose sp.												
Brant (Atlantic)												
Cackling Goose	2				1	3	8		3	1	**5**	2
Canada Goose	1,620	260	233	577	2,717	3,921	7,018	2,742	11,136	15,656	9,170	12,185
Snow Goose x Canada Goose												
Mute Swan									8			
Trumpeter Swan								1		3		
Tundra Swan	cw				3	cw			21		550	54
Wood Duck	3		3		1	1	4		4	2	2	12
Blue-winged Teal										2		
Northern Shoveler	7					2	2			31		16
Gadwall	71					**60**	15	34	64	**60**	1	109
American Wigeon	12					50	4	169	1	2		26
Mallard	605	101	200	36	166	596	304	70	314	579	173	942
Mallard (domestic type)												
American Black Duck	66	21			34	50	20	28	17	27	19	177
American Black Duck x Mallard	1	1								1		
Northern Pintail	4					3	13					10
Green-winged Teal	4				3		9			3	2	20
Canvasback					2				1,345		150	
Redhead	32							162	**232**		22	
Ring-necked Duck	24	8			27	136	97	415	45	338	250	165
Greater Scaup	**14**				1			1	271		12	
Lesser Scaup	27					20	5		4,162		117	2
Greater/Lesser Scaup							36		10			
Redhead x scaup sp.								1				
King Eider												
Common Eider												
Surf Scoter												
White-winged Scoter	**2**											
Black Scoter												
scoter sp.												
Long-tailed Duck	**5**								1			
Bufflehead	**206**	1	**7**		43	129	55	27	92	17	44	1
Common Goldeneye	9					cw			47		1	1
Barrow's Goldeneye												
Hooded Merganser	360	13	12	2	36	91	72	211	34	**254**	9	206
Common Merganser	**107**	10	14		54	32	1,453	197	242		10	**648**
Red-breasted Merganser	3						**13**		3			3
Ruddy Duck	199	10			5	2	11		**4,253**	62	47	7
duck sp.						48						
Northern Bobwhite												4
Wild Turkey	107	30	41	2	48	29	3	4	6	**62**		
Ring-necked Pheasant						1		2				
Pied-billed Grebe	21				10	7	7	37	7	10		2
Horned Grebe	1						4	12				
Red-necked Grebe								1				
Eared Grebe												
Western Grebe								1				
Western/Clark's Grebe								1				
Rock Pigeon	123	90	229	219	148	207	130	84	74	613	34	153
Mourning Dove	153	67	173	383	487	227	478	107	150	639	63	394

Species	Oakland	Allegany County	Washington County	Catoctin Mountain	Sugarloaf Mountain	Seneca	Triadelphia Reservoir	Loch Raven	Rock Run	Bowie	Elkton	Chesterville
Ruby-throated Hummingbird												
Rufous Hummingbird												
King Rail												
Clapper Rail												
Virginia Rail												
Rallus sp.												
Sora												
Common Gallinule												
American Coot	25					4	1	502	150	5	22	
Sandhill Crane				40		2						
American Avocet												
American Oystercatcher												
Black-bellied Plover												
Killdeer	14	2	7	1		17	2		37	16	12	9
Semipalmated Plover												
Ruddy Turnstone												
Red Knot												
Sanderling												
Dunlin												
Purple Sandpiper												
Western Sandpiper												
Long-billed Dowitcher												
American Woodcock						1				4		1
Wilson's Snipe	1					cw	5		2	4		1
Lesser Yellowlegs												
Willet												
Greater Yellowlegs												
Razorbill												
alcid sp.												
Bonaparte's Gull									25			
Laughing Gull												
Ring-billed Gull	4				1	683	184	73	7,953	603	1,012	608
Herring Gull						4			216	20	365	
Iceland Gull												
Lesser Black-backed Gull									1		1	
Glaucous Gull									**2**			
Great Black-backed Gull									126	3	130	
gull sp.						335			624	26		
Forster's Tern												
Royal Tern												
Red-throated Loon												
Common Loon	3					3		1	1			3
Northern Gannet												
Great Cormorant												
Double-crested Cormorant	2					25	cw	2	51	16	4	30
cormorant sp.												
American White Pelican												
Brown Pelican												
American Bittern												
Great Blue Heron	3	1	3	5	18	50	16	17	87	37	18	35
Great Blue Heron (white morph)												
Great Egret												
Green Heron												
Black-crowned Night-Heron									6			
Black Vulture		11	23	48	181	299	189	27	331	151	38	**374**
Turkey Vulture		cw	63	190	179	388	162	43	191	80	80	439
Osprey												
Golden Eagle												
Northern Harrier	2		3	2	7	6	**21**	3	4	4	1	10
Sharp-shinned Hawk	cw	2			3	9	6	3	7	7	5	6
Cooper's Hawk	5	3	10	9	**11**	18	8	9	6	8	3	**17**
Accipiter sp.	1					3		1				

Species	Oakland	Allegany County	Washington County	Catoctin Mountain	Sugarloaf Mountain	Seneca	Triadelphia Reservoir	Loch Raven	Rock Run	Bowie	Elkton	Chesterville
Bald Eagle	1	1	5	8	10	20	52	26	144	43	29	102
Red-shouldered Hawk	7	3	10	**30**	69	109	**89**	27	**32**	66	**13**	**27**
Red-tailed Hawk	16	8	25	59	51	54	35	22	27	28	18	53
Rough-legged Hawk												
Buteo sp.								1				
Barn Owl												
Eastern Screech-Owl	4		1			1	2		13		4	20
Great Horned Owl			cw		4	1	12	2	8	10	6	20
Barred Owl	1	1	2		2	14	7	2	4	14	4	11
Short-eared Owl							2					
Northern Saw-whet Owl										1		1
Belted Kingfisher	5	5	6	6	21	24	16	15	13	30	8	10
Red-headed Woodpecker		1	1	1	1	12						
Red-bellied Woodpecker	35	46	34	119	170	262	212	74	87	271	52	103
Yellow-bellied Sapsucker	1	7	**25**	56	81	142	**57**	15	42	88	**25**	29
Downy Woodpecker	69	49	57	111	237	354	195	103	108	271	45	**88**
Hairy Woodpecker	38	11	12	17	42	71	32	24	18	73	10	26
Northern Flicker		34	23	53	167	205	102	59	61	248	34	112
Pileated Woodpecker	12	18	25	32	65	95	67	20	26	88	15	**27**
American Kestrel	2	5	5	17	12	7	3	3	2	7	1	12
Merlin				1	1	3	**6**	2		cw	1	
Peregrine Falcon	2	1	1			2	1	1	2	2		
diurnal raptor sp.												
Eastern Phoebe	1	1	1		7	6	4		3	20	1	7
White-eyed Vireo												
Blue Jay	166	95	55	176	283	560	355	118	138	400	119	314
American Crow	568	117	102	173	589	1,842	1,695	767	318	1,473	221	**190**
Fish Crow		2		3	220	617	290	36	8	286	98	2
crow sp.			57	18	487	2,670	387	91	32	2,942		5
Common Raven	20	13	**8**	20	11	**19**	**16**	2	4	9		
Carolina Chickadee			86	160	323	488	276	170	237	476	86	216
Black-capped Chickadee	329	96		1	1							
chickadee sp.			2					1				
Tufted Titmouse	140	64	39	98	262	361	230	92	134	337	78	146
Horned Lark	29		**594**	485	15	244	159		5		7	412
Tree Swallow												
Ruby-crowned Kinglet		5	4	3	32	81	4	4	29	29	11	28
Golden-crowned Kinglet	14	13	10	10	26	109	24	17	59	80	28	33
kinglet sp.						1						
Cedar Waxwing	8			138	173	791	221	45	63	60	1	35
Red-breasted Nuthatch	10	10	1	1	1	10	11	5	10	50	7	20
White-breasted Nuthatch	114	63	33	137	249	326	211	121	90	213	57	78
Brown-headed Nuthatch												
Brown Creeper	6	2	5	8	29	69	19	7	24	48	15	29
Blue-gray Gnatcatcher						1						
House Wren						**3**		1		1		
Winter Wren	2	14	5	5	11	55	47	12	30	80	12	13
Sedge Wren												
Marsh Wren												1
Carolina Wren	52	110	76	171	**478**	662	432	194	224	656	117	**282**
Gray Catbird	1	1	**3**			5	1	5	1	18	3	2
Brown Thrasher				1	1	6	3		7	**24**		6
Northern Mockingbird		36	56	108	149	140	132	49	92	154	45	150
European Starling	381	205	2,420	2,480	2,968	3,296	1,583	2,043	849	11,098	959	2,355
Eastern Bluebird	10	65	55	85	323	731	425	133	181	308	55	281
Hermit Thrush	3	3	4	**11**	18	41	**78**	10	43	167	14	39
American Robin	2	45	209	**1,649**	281	2,079	603	558	277	5,025	296	58
House Sparrow	231	101	97	433	234	160	286	82	301	367	222	160
American Pipit		4	6	23	13	**426**	**359**	2	1	71	19	209
Evening Grosbeak	34					10						
House Finch	52	25	30(lc)	152	190	196	179	49	113	242	55	167
Purple Finch			17	27	48	25	21		20	97	1	2

Species	Oakland	Allegany County	Washington County	Catoctin Mountain	Sugarloaf Mountain	Seneca	Triadelphia Reservoir	Loch Raven	Rock Run	Bowie	Elkton	Chesterville
Common Redpoll	cw					**22**	1					
Red Crossbill										1		
Pine Siskin	4	2	1	16	38	61	20		2	45	2	1
American Goldfinch	54	134	113	134	224	970	272	182	194	345	30	119
finch sp.						30						
Lapland Longspur				1		cw			cw			2
Snow Bunting						1						
Chipping Sparrow					40	30	**43**	33	4	46	2	38
Clay-colored Sparrow					1							
Field Sparrow	3	5		1	52	45	127	48	48	186	11	174
Fox Sparrow	1		2	2	6	12	27	7	3	43	7	26
American Tree Sparrow	34	1		4	7	9	cw	4	9	13	8	cw
Dark-eyed Junco	397	501	718	**1,715**	1,217	1,356	**3,659**	435	799	2,650	603	1,191
White-crowned Sparrow	15	10	7	98	72	9	31		4			**382**
White-crowned Sparrow (Gambel's)												1
White-throated Sparrow	18	**453**	410	**1,682**	**2,517**	3,588	**4,070**	1,527	1,585	5,172	608	2,346
Zonotrichia sp.						1						
Vesper Sparrow												
Seaside Sparrow												
Nelson's Sparrow												
Saltmarsh Sparrow												
Nelson's/Saltmarsh Sparrow												
Savannah Sparrow	6			20	**31**	24	59	5	20	67	3	374
Savannah Sparrow (Savannah)												
Savannah Sparrow (Ipswich)												
Song Sparrow	152	119	111	291	728	743	947	364	633	1,130	232	**1,228**
Lincoln's Sparrow	1									1		
Swamp Sparrow	19	6		1	42	67	29	13	50	**335**	9	**206**
sparrow sp.						8		8				
Eastern Towhee			2	2	19	37	70	25	31	88	6	51
Eastern Meadowlark			13	16	19	68	2			24		
Baltimore Oriole							1					
Red-winged Blackbird	68	1	cw	44	639	1,249	429	1,736	1,286	2,018	1,713	11,683
Brown-headed Cowbird	1	cw	2	140	66	225	322	32	91	44	452	185
Rusty Blackbird	5			6		15	3	1	15	5		
Common Grackle	25			84	13	11	30	1,143	3,516	630	31,303	20,657
Boat-tailed Grackle												
blackbird sp.		9			114	742	40		2,491	407		
Black-and-white Warbler												
Orange-crowned Warbler									1	1		1
Common Yellowthroat										2		
Palm Warbler				1						1		1
Palm Warbler (Western)												1
Palm Warbler (Yellow)												6
Pine Warbler					1	1	cw		2			
Yellow-rumped Warbler		11	6	6	27	121	13		7	12	5	13
Yellow-throated Warbler												
warbler sp.						1						
Northern Cardinal	156	223	320	450	726	1,124	711	338	386	862	142	440

Table 4. 2020–2021 Maryland Christmas Bird Counts: Tidewater counts. (bolded species name = unusual for the Maryland counts; bolded number = high count record; cw = count week; lc = low count)

Species	Middle River	Annapolis-Gibson Island	Patuxent River	Jug Bay	Point Lookout	Lower Kent County	Denton	Port Tobacco	St. Michaels	Southern Dorchester County	Crisfield	Salisbury	Ocean City
Snow Goose	21			3		6,321	922		163	1,500		5	5,626
Ross's Goose						3							
Greater White-fronted Goose						**6**			**3**				
domestic goose sp.	3												
Brant (Atlantic)													1,626
Cackling Goose		1	2	**6**	1	29	1			3			
Canada Goose	1,782	7,793	4,017	11,686	4,783	40,658	5,008	2,213	42,806	6,266	955	6,877	15,516
Snow Goose x Canada Goose						1							
Mute Swan	11	2		2									
Trumpeter Swan				**10**						4			
Tundra Swan	6	303	27	106	20	769	418	6	184	498	38	7	466
Wood Duck	2	2		6	3	23	12		1	54	35	36	**75**
Blue-winged Teal										10			
Northern Shoveler	**1**	**29**		cw		224			cw	**275**			153
Gadwall	160	27	24	145		117	6	16	13	56	15	23	362
American Wigeon	43		15	1		6				10	26	3	135
Mallard	626	1,100	188	818	21	3,886	152	66	221	1,084	92	342	1,175
Mallard (domestic type)	3												
American Black Duck	30	126	14	393	3	782	100	6	26	287	160	92	772
Am. Black Duck x Mallard						3				1			
Northern Pintail	1			25		135	10		14	1,604		2	28
Green-winged Teal	27			69		101			cw	87	3	40	479
Canvasback	3	3,684	19			319		55	115	102			178
Redhead		2				4			40	3			19
Ring-necked Duck	25	37	3	**233**		50	18			461	4	126	189
Greater Scaup	24	708	1	47	10	1,235			21	1			4
Lesser Scaup	292	110	2	5	15	2,488	2		221	34		1	91
Greater/Lesser Scaup	650	577			19	1,835							1
Redhead x scaup sp.													
King Eider													3
Common Eider													97
Surf Scoter		672	15	282	29	**246**			429	40	192		291
White-winged Scoter		2		2	20				cw		2		4
Black Scoter		84	105	225	405	39			133				49
scoter sp.		8		100							65		13
Long-tailed Duck	2	278	133	105	57	163			173	3	12		31
Bufflehead	113	2,249	476	549	456	834	12	115	1,436	168	318	199	1,660
Common Goldeneye	7	101	42	32	68	68			124	41	5	2	5
Barrow's Goldeneye					cw								
Hooded Merganser	206	112	37	41	17	35	16	2	29	148	49	35	196
Common Merganser	10	18		89			23		1	112			
Red-breasted Merganser	9	4	4		7	11			5	53	1	6	284
Ruddy Duck	807	6,888	290(lc)	319	369	980	66	886	1,503	45	15	283	245
duck sp.	2	50											
Northern Bobwhite													1
Wild Turkey	67	27		12	**61**	16	12		19		5	8	13
Ring-necked Pheasant						2							
Pied-billed Grebe	9	14	**9**	2		1	1		cw	5		7	30
Horned Grebe		9	50	3	17	8			32	2	4	1	54
Red-necked Grebe		1							1				
Eared Grebe									cw				
Western Grebe													

Species	Middle River	Annapolis-Gibson Island	Patuxent River	Jug Bay	Point Lookout	Lower Kent County	Denton	Port Tobacco	St. Michaels	Southern Dorchester County	Crisfield	Salisbury	Ocean City
Western/Clark's Grebe													
Rock Pigeon	255	183	55	592		49	114	16	36	30	590	164	405
Mourning Dove	191	407	141	259	150	180	301	117	232	40	104	352	321
Ruby-throated Hummingbird													1
Rufous Hummingbird								1					
King Rail						1				3			
Clapper Rail			1	1	cw					9	8	2	12
Virginia Rail	3	4		**14**		19	1			38	32	16	4
Rallus sp.										5	35		
Sora		2		2					cw	1		1	
Common Gallinule													cw
American Coot	3	40	2			1			3	35		7	72
Sandhill Crane	**58**												
American Avocet									cw				
American Oystercatcher													20
Black-bellied Plover									cw				163
Killdeer	12	cw	14	61	43	58	5	40	9	19	130	147	40
Semipalmated Plover													2
Ruddy Turnstone													7
Red Knot													1
Sanderling									cw				304
Dunlin						8			cw	74	291		**5,502**
Purple Sandpiper				cw									23
Western Sandpiper													11
Long-billed Dowitcher										1			1
American Woodcock			2	2	2	5	1	1		3	4	cw	6
Wilson's Snipe				3	3	1	14			4	7		50
Lesser Yellowlegs											7		
Willet											3		1
Greater Yellowlegs				cw					cw	40	170	6	27
Razorbill													31
alcid sp.													32
Bonaparte's Gull	2		1		229	1							29
Laughing Gull	2							**125**	4				
Ring-billed Gull	3,543	678	1,080	2,578	1,606	1,409	510	143	362	1,259	1,436	595	1,215
Herring Gull	188	270	731	916	79	150	1	100	487	126	361	437	838
Iceland Gull									1				
Lesser Black-backed Gull		1		cw					1			1	4
Glaucous Gull													
Great Black-backed Gull	41	75	**639**	83	56	106		2	27	5	10	56	206
gull sp.	25	74		24				31		120			
Forster's Tern					1								421
Royal Tern													**7**
Red-throated Loon		1	1		22	5							73
Common Loon	2	4	52	4	84	12			24	7	7	1	93
Northern Gannet				1	149								95
Great Cormorant			**9**			4							
Double-crested Cormorant	100	2,439	**1,840**	155	86	**1,655**	11	36	26	2	13	71	**171**
cormorant sp.		5											
American White Pelican										1			**66**
Brown Pelican			121		105				1				
American Bittern										1			
Great Blue Heron	37	115	34	36	13	42	15	9	47	90	91	29	93
Gr. Blue Heron (white morph)			cw										
Great Egret	2					**2**				4	2		1
Green Heron			1										**2**
Black-crowned Night-Heron									cw		4		32
Black Vulture	75	144	97	505	6	114	41	9	179	**161**	93	44	112
Turkey Vulture	59	159	92	339	21	355	318	264	281	304	513	199	392
Osprey			1										

Species	Middle River	Annapolis-Gibson Island	Patuxent River	Jug Bay	Point Lookout	Lower Kent County	Denton	Port Tobacco	St. Michaels	Southern Dorchester County	Crisfield	Salisbury	Ocean City
Golden Eagle						1				1			
Northern Harrier	3		4	14	2	11	8	19	5	49	32	13	22
Sharp-shinned Hawk	5	6	1	3	3	9	4		7	3	5	2	12
Cooper's Hawk	10	10	**5**	6		9	5	3	8	5	7	6	16
Accipiter sp.		1		1				1					
Bald Eagle	36	31	32	74	20	130	43	83	65	163	**143**	69	84
Red-shouldered Hawk	22	27	22	29	7	10	32	**31**	5	8	13	11	**21**
Red-tailed Hawk	18	19	8	29	7	46	24	14	14	15	15	17	28
Rough-legged Hawk						1		1					
Buteo sp.													
Barn Owl				3		1							
Eastern Screech-Owl		12	10	3	2	25	19	3	58	9	32	23	23
Great Horned Owl		5	6	7	4	33	11	1	38	26	22	13	10
Barred Owl		5	3	4		7	6	2	6	**9**			3
Short-eared Owl			1		1	1			cw	11			2
Northern Saw-whet Owl					cw								**5**
Belted Kingfisher	14	40	22	27	5	13	6	16	26	25	27	19	24
Red-headed Woodpecker				5		1		4					
Red-bellied Woodpecker	57	224	41	151	31	105	85	78	66	32	66	42	81
Yellow-bellied Sapsucker	24	73	**41**	57	9	29	16	25	42	3	**22**	15	26
Downy Woodpecker	85	251	39	121	29	79	7	60	81	66	48	35	62
Hairy Woodpecker	15	48	8	48	4	32	9	9	6	8	13	6	18
Northern Flicker	56	124	29	96	39	124	52	60	87	51	84	60	147
Pileated Woodpecker	10	47	13	60	4	24	30	24	14	14	22	17	14
American Kestrel			6	7	7	9	10	1	cw	5	6	9	22
Merlin	4	1	1	1			1	1	1	1	1	2	3
Peregrine Falcon	1	4		1		2				2	**3**		4
diurnal raptor sp.	1												
Eastern Phoebe		2	1	14	6		6	1	1	4	22	10	22
White-eyed Vireo											1		
Blue Jay	120	470	79	189	15	281	108	186	288	19	144	54	171
American Crow	226	705	598	851	253	212	86	265	286	413	477	234	443
Fish Crow	151	105	1	179	1	3		78		549	17	189	201
crow sp.	126	29		425				6	41	3,385	108	61	107
Common Raven	1	1		**4**									
Carolina Chickadee	137	526	117	181	115	141	85	51	209	166	175	133	501
Black-capped Chickadee													
chickadee sp.													
Tufted Titmouse	69	456	74	158	58	124	61	101	150	37	64	93	156
Horned Lark	2		47	1	2	113	179	3	50	2		2	35
Tree Swallow										144	94		7
Ruby-crowned Kinglet	22	44	23	48	22	32	12	17	30	30	33	21	34
Golden-crowned Kinglet	15	15	26	13	13	15	19	20	25	31	13	70	28
kinglet sp.													
Cedar Waxwing	14	1,420	71	594	20	290	122	345	293	18	31	30	54
Red-breasted Nuthatch	7	41	30	26	17	35	16	13	**170**	6	15	22	58
White-breasted Nuthatch	37	205	40	98	10	54	31	34	58	6	**13**	9	28
Brown-headed Nuthatch			22		**660**	17			52	231	119	27	66
Brown Creeper	14	34	3	17	4	11	12	9	15	19	7	22	8
Blue-gray Gnatcatcher													
House Wren	1	1				2			1	2		2	9
Winter Wren	16	40	7	32	3	31	10	20	17	21	29	21	31
Sedge Wren						2				2	5	2	
Marsh Wren		1	1			7				17	16		2
Carolina Wren	186	611	168	**407**	111	272	89	115	189	108	135	116	309
Gray Catbird	6	8	3	12	3	6	**5**		1	12	22	15	34
Brown Thrasher	11	17	7	23		19	11	6	16	7	11	16	29
Northern Mockingbird	70	121	40	87	27	97	61	37	108	30	52	66	104
European Starling	2,771	2,377	1,955	2,623	626	2,223	1,261	1,069	2,310	1,413	898	2,112	29,875
Eastern Bluebird	60	312	148	249	134	189	208	168	470	192	180	192	266

Species	Middle River	Annapolis-Gibson Island	Patuxent River	Jug Bay	Point Lookout	Lower Kent County	Denton	Port Tobacco	St. Michaels	Southern Dorchester County	Crisfield	Salisbury	Ocean City
Hermit Thrush	39	148	35	75	10	24	33	13	33	38	25	50	42
American Robin	1,459	5,465	366	1,170	111	189	2,041	1,613	1,699	869	274	3,225	6,688
House Sparrow	466	450	73	86	20	49	115	19	64	12	31	7	170
American Pipit	134		77	259	17	**523**	16	9	8	1		7	16
Evening Grosbeak													
House Finch	78	283	47	67	14	63	50	27	91	2	17	24	139
Purple Finch	13	29	1	75	21	1	15	6	29	1		1	22
Common Redpoll													
Red Crossbill				cw	8	1				5			3
Pine Siskin	1	84	2	11	51	51	**18**	60	20	2	17	1	73
American Goldfinch	73	418	57	155	75	101	510	77	119	44	115	63	323
finch sp.													
Lapland Longspur				2	cw								
Snow Bunting													
Chipping Sparrow	7	68	18	4	4	29	74	19	9	3	132	68	206
Clay-colored Sparrow											1		1
Field Sparrow	20	105	11	69	23	104	63	35	8	14	17	61	55
Fox Sparrow	21	13	3	32	33	34	**13**	4	6	21	24	18	20
American Tree Sparrow	2			4		2					8		
Dark-eyed Junco	410	2,199	486	1,182	339	646	719	585	641	68	165	391	380
White-crowned Sparrow	1	1	3		2	3(lc)	**30**	8	4			2	2
White-crown. Spar. (Gambel's)													
White-throated Sparrow	995	3,491	555	2,642	47	1,836	888	763	616	71(lc)	483	685	1,143
Zonotrichia sp.													
Vesper Sparrow				1									
Seaside Sparrow											3		
Nelson's Sparrow													2
Saltmarsh Sparrow											4		8
Nelson's/Saltmarsh Sparrow													3
Savannah Sparrow	4	1	27	51	35	172	70	17	38	80	50	44	
Savannah Sparrow (Savannah)													74
Savannah Sparrow (Ipswich)													30
Song Sparrow	297	804	174	663	158	1,044	230	256	250	383	327	266	533
Lincoln's Sparrow													**2**
Swamp Sparrow	90	108	**52**	109	15	**436**	20	53	31	368	222	237	228
sparrow sp.	1												
Eastern Towhee	16	46	9	72	9	86	8	12	7	8	16	19	40
Eastern Meadowlark			59	51	27	14	57	16		195	27	48	203
Baltimore Oriole							cw						
Red-winged Blackbird	2,111	1,142	217	73,915	876	15,094	581	1,330	2,758	7,045	3,375	3,971	30,130
Brown-headed Cowbird	258	210	53	108	40	251	593	246	23	183	7	188	121
Rusty Blackbird			10	66			3	14		7	65	1	56
Common Grackle	409	617	98	2,488	15	5,697	3,674	140	11	68	255	181	9,861
Boat-tailed Grackle										50	15		3
blackbird sp.		11		59			250	103				200	
Black-and-white Warbler		1											
Orange-crowned Warbler	1	cw			cw	1				1			**6**
Common Yellowthroat		2								1	1		5
Palm Warbler			**3**	2	3	3			1	**18**	10	1	1
Palm Warbler (Western)													4
Palm Warbler (Yellow)													
Pine Warbler					5	3	2		2	7	2		7
Yellow-rumped Warbler	12	26	69	10	151	77	2	78	136	389	564	14	1,294
Yellow-throated Warbler													1
warbler sp.													
Northern Cardinal	262	1,146	200	498	249	481	189	196	242	77	102	151	213

Maryland Birdlife 70(2):89–93

2021 Maryland Mid-winter Bird Count

Erika L. Norton

1100 Higgins Place, Apt. 531, Rockville, Maryland 20852;
errnorton@gmail.com

The 2021 annual Maryland Mid-winter was held on multiple dates between 2 January and 13 February 2021 (Table 1). Data were submitted for Carroll, Frederick, Howard, and Kent Counties, as well as for the Fred J. Archibald and Audrey Carroll Audubon Sanctuaries, and the Chesapeake and Ohio (C&O) Canal.

The C&O Canal locations include the District of Columbia (DC) plus the four counties in Maryland bordering the park's towpath. Overall, C&O towpath coverage was 89.4% with county coverage as follows: DC - 100%; Montgomery - 97%; Frederick - 100%; Washington - 79%; Allegany - 100%. No stationary counts were submitted in 2021. Data were submitted for eight of the nine count days. Additional C&O count compilation information can be found on eBird at: https://ebird.org/view/checklist/S83276110.

Table 1. 2021 Maryland Mid-winter Bird Count: Participating counties, codes, dates, and compilers.

County	Code	Date	Compiler
Chesapeake & Ohio Canal	C&O	23 January 2021– 31 January 2021	James Speicher
Fred J. Archibald Audubon Sanctuary	FAAS	09 January 2021	David Smith
Audrey Carroll Audubon Sanctuary	ACAS	02 January 2021	David Smith
Frederick	FR	30 January 2021	David Smith
Carroll	CA	16 January 2021	Bill Ellis
Howard	HO	13 February 2021	Joe Hanfman
Kent	KE	30 January 2021	Walter Ellison, Nancy Martin

This year's Mid-winter count data were collected through the hard work of 211 individuals in 163 parties (Table 2). There were 100,129 individual birds of 111 different species observed. Across all count areas, 399 mi (642 km) were covered on foot over 359 hours. There were 181 hours of driving over 1,622 mi (2,610 km). There were 12 hours of owling performed over 53 mi (85 km) in Frederick, Carroll, and Howard Counties in addition to the Audrey Carroll Audubon Sanctuary. Feeder observations occurred over 69 hours in Frederick, Carroll, and Howard Counties, and in Howard County, there was an additional 3.2 hours of stationary observation. Uniquely in Frederick County, 15 mi (24 km) were covered via bicycle over 3.5 hours.

Weather conditions for this year's count were reported from all areas, and overall seemed to be less variable than last year's. The majority of count days had temperatures ranging from the mid-20s °F to low 40s °F with low winds. However, the C&O count did see temperatures in the low teens, three days of over 20 mph (32 km/h) winds, and snow on 31 January. Generally, ice coverage was seen on smaller bodies of water and the C&O Canal. Howard County's count was curtailed by freezing rain towards the end of the day that drove counters off the roads and in particular, reduced coverage of the Triadelphia Reservoir.

Table 2. 2021 Maryland Mid-winter Bird Count: Summary.

	C&O	FAAS	ACAS	FR	CA	HO	KE
Total Species	76	41	45	88	76	81	81
Total Birds	16,275	634	447	24,153	19,840	16,168	22,612
Start Time	NA	0609	0600	0500		0645	0700
Stop Time	NA	1223	1200	1700		1730	1743
Parties	56	1	1	37	18	45	5
Number of Observers	60	3	8	51	23	60	6
Hours Driving	0			108.68	32	27.1	13
Miles Driving	0			977	368	171.7	105
Hours Walking	162.83	6.53	6	64.63	48	62.1	9
Miles Walking	164.5	6.02	4.14	65.80	48	104.2	6
Hours Owling	0	1	1	6.38	3.3	0.3	
Miles Owling	0	0		42.76	9.7	0.5	
Hours Biking				3.5			
Miles Biking				15			
Feeder Hours	0	0		10.6	7.5	50.8	
Stationary Hours	0	0				3.2	

As expected, Canada Geese were the most numerous species of the count, totaling 29,832 individuals across all count areas (Table 3). While Snow Geese were only observed in Kent County this year, the total number of individuals (3,540) was more than triple that observed last year (1,084), but still small in comparison to the flocks observed in Kent County in 2019, totaling over 13,000 individuals. In regards to rarer species, a total of 6 Cackling Geese were observed this year in Frederick, Howard, and Kent Counties and 2 Greater White-fronted Geese were observed in Frederick County. A notably lesser number of smaller waterfowl (such as Gadwall, American Black Duck, and Ring-necked Duck) were observed in Kent County than in previous years, which was attributed to increased ice cover on small bodies of water. Green-winged Teal were not observed in any area of this year's count.

Red-tailed and Red-shouldered Hawks were the two most numerous raptors observed. Both of these species were observed in all count locations, with the exception of Red-shouldered Hawks in the Fred J. Archibald Audubon

Sanctuary. Three species of owls were present in this year's count, of which Barred Owls were the most common. Only three species of gulls were confirmed in this year's count.

Two of the most common winter passerines occurred in significantly larger numbers than last year, even when taking the absence of data from Baltimore County into account. In 2021, the total of White-throated Sparrows observed was 6,992 and in 2020 was 4,332 (3,661 if you subtract the 671 individuals observed in Baltimore County that year. The data for Dark-eyed Juncos were similar with 3,497 counted in 2021 and 2,275 in 2020 (1,955 subtracting individuals from Baltimore County. Red-breasted Nuthatches were also noticeably more common in 2021, with 46 counted across all count areas except for the Fred J. Archibald Audubon Sanctuary. In 2020, only 3 Red-breasted Nuthatches were observed and they were only in Baltimore County and along the C&O Canal. Evening Grosbeaks made a very nice showing this year with 37 along the C&O Canal and 12 in Frederick County.

There were two very unexpected species for the region this year: in Howard County, a Western Tanager; and in Frederick County, a Painted Bunting.

Table 3. 2021 Maryland Mid-winter Bird Count: Observed species.

Species	C&O	FAAS	ACAS	FR	CA	HO	KE
Snow Goose							3,540
Greater White-fronted Goose				2			
Cackling Goose				2		2	2
Canada Goose	2,421	90	25	5,297	3,567	5,572	12,860
Mute Swan				1			
Tundra Swan				12			
Northern Shoveler				12			28
Gadwall	6			4	28	3	
American Wigeon						5	
Mallard	474			390	161	84	223
Mallard (domestic type)	26						
American Black Duck	56			20	2	30	8
Northern Pintail							34
Canvasback						2	8
Redhead				2			
Ring-necked Duck	277			24	44	10	50
Greater Scaup							100
Lesser Scaup					6	6	380
scaup sp.							800
Surf Scoter							24
Long-tailed Duck						2	13
Bufflehead	200			3	13	33	101
Common Goldeneye	46						4
Hooded Merganser	45				5	85	15
Common Merganser	456			77	48		78
Ruddy Duck				1			18
duck sp.	30						
Wild Turkey	33	12	feather	14			

Species	C&O	FAAS	ACAS	FR	CA	HO	KE
Ring-necked Pheasant				1			
Pied-billed Grebe	4				2		1
Rock Pigeon	222	1		588	177	21	45
Mourning Dove	91	28	1	409	309	205	72
Killdeer	3			3	3	2	7
Wilson's Snipe						1	
Ring-billed Gull	229			2	10	157	109
Herring Gull	4						8
Great Black-backed Gull	1						5
gull sp.	13					1	
Double-crested Cormorant	2						20
Great Blue Heron	36			28	17	7	16
Black Vulture	102	6	3	242	316	63	16
Turkey Vulture	150	7	8	494	238	37	123
Northern Harrier				2	2		1
Sharp-shinned Hawk	1			4	4	4	1
Cooper's Hawk	11		1	15	7	14	3
Sharp-shinned/Cooper's Hawk	1						
Accipiter sp.						2	
Bald Eagle	62		1	13	18	7	27
Red-shouldered Hawk	42		2	98	34	49	4
Red-tailed Hawk	25	4	2	137	77	11	7
Buteo sp.				4			
hawk sp.	2						
Eastern Screech-Owl				8	1		
Great Horned Owl		2	1	11	1		3
Barred Owl	4	1	1	12	5		2
Belted Kingfisher	33		1	22	14	9	2
Red-headed Woodpecker	2			2	2		
Red-bellied Woodpecker	296	9	8	273	91	119	25
Yellow-bellied Sapsucker	101	3	3	62	12	12	3
Downy Woodpecker	393	12	8	186	89	104	14
Hairy Woodpecker	73	2	2	43	28	25	4
Downy/Hairy Woodpecker	1						
Northern Flicker	96	4	4	87	32	47	20
Pileated Woodpecker	188	2	3	70	23	17	1
woodpecker sp.	30						
American Kestrel	3			29	21	1	3
Merlin					2	1	
Peregrine Falcon	1			2		1	
Eastern Phoebe	15			4		4	
Blue Jay	80	8	6	238	127	146	29
American Crow	588	11	8	1,104	591	952	12
Fish Crow	39	1	1	162	82	868	
crow sp.	56			83		498	2
Common Raven	86			39	13	1	
Carolina Chickadee	533	13	3	361	121	88	27
Black-capped Chickadee	89					1	
Carolina/Black-capped Chickadee	4						
Tufted Titmouse	373	8	9	247	67	104	33
Horned Lark				111	26	62	113
Ruby-crowned Kinglet	50		2	12		6	2
Golden-crowned Kinglet	160	3	6	23	7		

Species	C&O	FAAS	ACAS	FR	CA	HO	KE
Cedar Waxwing	19		37	44	45	44	14
Red-breasted Nuthatch	4		1	4	9	8	20
White-breasted Nuthatch	383	15	3	219	102	66	14
Brown Creeper	101	1	2	28	11	5	
Winter Wren	66	3	3	21	5	6	1
Carolina Wren	759	16	16	401	130	110	42
Gray Catbird						2	
Brown Thrasher							5
Northern Mockingbird	25	8	7	189	83	52	24
European Starling	992	62	14	5,645	2,542	797	761
Eastern Bluebird	379	23	14	318	296	133	25
Hermit Thrush	19	1	1	11	8	5	1
American Robin	431	2	1	519	248	166	20
House Sparrow	55			669	152	245	37
American Pipit				33			
Evening Grosbeak	37			12			
House Finch	27	13	7	516	130	161	23
Purple Finch	18	1		37	19	24	1
Pine Siskin				37	3	31	3
American Goldfinch	197	5	6	242	140	162	36
Chipping Sparrow	2			18	1	32	
Field Sparrow	13	5	2	35	17	25	1
Fox Sparrow	2			3	4	9	5
American Tree Sparrow		1		4		7	
Dark-eyed Junco	763	24	4	1,006	369	1,208	123
White-crowned Sparrow	9			39	2	24	
White-throated Sparrow	2,239	89	97	1,443	1,007	1,902	215
Savannah Sparrow				6	1	48	1
Song Sparrow	322	20	37	459	177	320	53
Swamp Sparrow	15		1	23	6	23	21
sparrow sp.	12						
Eastern Towhee	2		2	15	21	26	5
Eastern Meadowlark				4		4	1
Baltimore Oriole						1	
Red-winged Blackbird	20	95	42	134	8	287	380
Brown-headed Cowbird		1		158	4	80	8
Rusty Blackbird	cd [a]			8			
Common Grackle	312			17	7,500	206	1,590
blackbird sp.				14		31	
Pine Warbler					2		
Yellow-rumped Warbler	68		1	14	6	2	23
Western Tanager						1	
Northern Cardinal	604	22	40	715	348	434	113
Painted Bunting				1			
passerine sp.	15				1		

[a] The C&O Rusty Blackbird, found on the section between mileposts 45 & 46, was the lone Count Day (cd) species recorded in 2021. Count Day species are those seen outside of the official survey period as people are backtracking along the towpath. Since the count's revival in 2018, participants are instructed to survey by recording species in one direction only, in either direction, starting from one milepost to the next milepost, noting start and end times.

Maryland Birdlife 70(2):94–96

2021 Spring Raptor Migration at Fort Smallwood Park, Anne Arundel County, Maryland

Sue A. Ricciardi

1132 Ferber Avenue, Arnold, Maryland 21012-1837
susiericc@comcast.net

That the Fort Smallwood Park Hawkwatch would enjoy an all-time high number of migrant raptors in 2021 was completely unexpected, but so very welcome during a second COVID-19 spring. The total spring count of 16,098 raptors was a lofty 64% above the ten-year (2011–2020) average. Weather likely played a major role with not only more days of fair skies than usual, but also an abundance of favorable winds. Westerly winds, which tend to push migrants toward the hawkwatch site, were present on 70 (74%) of the 94 days of coverage. Accordingly, there was a positive effect on the days and hours (520 hrs) of coverage as both were well above their five-year (2016–2020) averages, the former by 13% and the latter by 19%. Equally unexpected was the deluge of migrant Turkey Vultures. The seasonal count of 11,303 individuals annihilated the previous record of 7,654 which had just been set the year before.

Table 1 displays the counts for Spring 2021 for the most common raptor species along with respective changes relative to their 5-year and 10-year averages.

Table 1. 2021 Common raptor species. The 2021 count and 5-year and 10-year percentage changes.

	Black Vulture	Turkey Vulture	Osprey	Northern Harrier	Sharp-shinned Hawk	Cooper's Hawk	Bald Eagle	Mississippi Kite	Red-shouldered Hawk	Broad-winged Hawk	Red-tailed Hawk	American Kestrel	Merlin	Season Total
2021 Count	574	11,303	427	39	1,375	315	225	8	336	845	314	209	60	16,098
5-YR % Change	+61	+75	-7	-26	+36	+47	+20	-43	+153	+99	+93	+74	+30	+66
10-YR % Change	+42	+84	-4	-40	+21	+16	+32	-4	+84	+78	+78	-2	+28	+64

As is evident, count numbers for most species were above their averages, and by large margins. Osprey and Mississippi Kite numbers were down, but they tend to fluctuate yearly and do not seem to portend a worrisome trend. Northern Harrier numbers, on the other hand, continue a long downward slide that is now about

twelve years in the making. The Black Vulture count was a new seasonal record and the Bald Eagle count tied its seasonal high. Hopefully, the healthy Sharp-shinned Hawk numbers and recent yearly increases indicate that a prolonged upswing is taking place. The three buteos were especially numerous and pleasing to see. After decades of declining counts, American Kestrel numbers may have finally bottomed out and stabilized, albeit at disappointingly low levels.

February: The season began 23 February with only three raptors that day, but one of them was an Osprey, beating by two days its prior earliest spring arrival date set in 2016. Three more days of February coverage yielded another 94 migrants of which 79 were Turkey Vultures, in hindsight, heralding the start of their huge migration season.

March: With 28 days of coverage, the month was notable for two days, 26 and 29 March, when more than one thousand migrants were counted each day. Unsurprisingly, Turkey Vultures dominated, making up 1,425 of the 1,815 migrants on 26 March, and 1,330 of the 1,435 migrants on 29 March. Also counted on 26 March, were 78 Sharp-shinned Hawks (the most on a March day in about 20 years), 42 Cooper's Hawks, 67 Red-shouldered Hawks, 40 Red-tailed Hawks, and 87 American Kestrels. Golden Eagles are rarely seen at this Coastal Plain hawkwatch, but one passed by on 16 March. The tally of 6,940 Turkey Vultures in March by itself eclipsed seasonal totals of the species for all but three of the past count years.

April: Counters were weathered out for only one day in April and the month's total of 5,983 migrants was 49% above the 10-year average. Turkey Vultures again reigned with numbers 83% above their 10-year April average. Additionally, Bald Eagles made a good showing along with Broad-winged Hawks, of which 247 of the latter were tallied on 16 April. Though April is usually characterized by a "thousand-bird" day or two, there were none this season. The highest count day came on 11 April, with 587 migrants.

May: The 27 coverage days resulted in an average count for the month. Sharp-shinned Hawks were numerous in early May and finished the month 42% above their 10-year May average. Interestingly, Turkey Vultures were 10% below their May norm. The first Mississippi Kite of the season appeared on 25 May, two days past the previous latest arrival date. Even so, all eight individuals in the season were counted in May. It's unclear what effect the 17-year periodical cicada invasion had on kite migration at the hawkwatch.

June: The spring count ended on 8 June after six days of June coverage. Sixty-one migrants were tallied, 22% above the 10-year average, with Turkey Vultures, Ospreys, Bald Eagles, and Broad-winged Hawks leading the way. To cap off raptor observations for the season, a pair of Ospreys returned to the area along the Park's northwest border where they nested and produced young. Observers were treated to courtship displays, dramatic plunges for fish, spats with Bald Eagles and courses through treetops to break off branches for the nest.

Fort Smallwood Park is known for a robust spring migration of non-raptors as well. A very impressive blackbird movement was documented with over 60,400 individuals counted, including over 24,000 Common Grackles, 10,600 Red-winged Blackbirds, and 25,400 blackbird sp. On 9 March alone, more than 24,400 blackbirds of various species were tallied. Over 1,600 American Goldfinches were also observed this season and Blue Jays passed by in numbers similar to the banner year of 2019 with almost 24,000 spotted heading north. Other notable observations were 20 Redheads on 4 March; a remarkable 32 Great Blue Herons on 25 March; Common Raven, 2 on 13 April and 1 on 21 April; Sora on 28 and 30 April and 2 May; 21 Common Nighthawks (Mississippi Kite teasers) on 13 May; and an Alder Flycatcher on 25 May. Eastern Kingbirds and Orchard Orioles nested within view of the hawkwatch site. One of the kingbirds barely escaped after getting entangled in fishing line it was using as nesting material. It may be that Common Ravens are nesting in the general area, but a limited investigation was unrevealing. Pied-billed Grebes and American Coots were present almost daily from the last week of February into the first part of May with as many as 5 individuals at one time of the former and 7 of the latter. No new species were observed this season, keeping the total at 286.

Thankfully the COVID-19 pandemic had much less effect on our count protocols this spring as compared to last, since we were able again to count from our traditional location. Sincere gratitude is extended to the Park staff for their steady support during these difficult times. Many thanks are due to a faithful core of regular observers and other seasoned hawkwatchers, namely Sue Ricciardi, Chris Reed, Dan Walker, Lynn Davidson, Hal Wierenga, Cristians Rivas, Fred Shaffer, Hugh Hoffman, Bob Rineer, John Hoffman, Marty Miller, Alan and Sue Young, Dan Stewart, Andy Smith, Jim Stasz, and Andy Francis.

Last year's report should have acknowledged our new hawkwatch sign (photo at left). Thanks to Chris Reed for taking on the project from start to finish.

The 2019 annual hawkwatch report closed with the following tongue-in-cheek forecast: "Spring 2020 will have favorable winds every day and we'll have several record-high counts." Well, the prediction was correct; it was just a year late! Making projections about flights at Fort Smallwood Park is done at one's peril. What can be relied upon is unexpected, rewarding, novel, and spectacular experiences. You are invited to partake in them in 2022!

MARYLAND BIRDLIFE

NOTICE TO CONTRIBUTORS

Contributors should prepare manuscripts according to the following instructions.

Title: The title should be brief, concise, and pertinent.

Abstract: An abstract is required for all long articles; suggested for all biologic studies more than two (2) pages in length; but is not needed for notes, distribution reports, or short observations (especially if two pages or shorter in length). The abstract should provide a capsule description of the main thrust, methods, and essential findings of the article. It should contain the scientific name of the main subject species.

Text: Manuscripts should be double-spaced, lines numbered, and submitted in MS Word™ by e-mail. Please identify respective file name(s) for text, figure titles, and descriptions of graphs or figures. First mention of a biological organism, in the abstract and text should include the full scientific name in italics. Carefully check the spelling of all scientific names. Capitalize the first letter of each word comprising the "official" common name for faunal species. Short articles and general notes (20 pages or less) are preferred. Camera-ready, color illustrations, pictures, or digital images are preferred.

References: References should be given in an author-date format: (Robbins 1987); (Robbins 1987, 1988); (Robbins, in press); (Robbins, in litt.); (Robbins, pers. comm.); (Robbins and Robbins 1987); and (Robbins et al. 1987) for three or more authors. Provide evidence of acceptance for works "in press," or cite as "unpublished", "in litt." (written), or "pers. comm." (verbal), written permission is suggested as well. Citations shall be listed alphabetically, under LITERATURE CITED, as in the following examples: **Articles**: Robbins, C.S. 1965. New breeding bird survey tested in Maryland this summer. *Maryland Birdlife* 21(2):48–49. Do not abbreviate the titles of journals. **Books**: Ellison, W.G. (Editor). 2010. *2nd Atlas of the Breeding Birds of Maryland and the District of Columbia*. The Johns Hopkins University Press, Baltimore, MD. 494 pp. **Internet**: Ritchison, G., F.R. Gehlbach, P. Pyle, and M.A. Patten. 2020. Eastern Screech-Owl (*Megascops asio*), version 1.0 (text last updated 7 March 2017). In Birds of the World (P.G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. Available at: https://doi.org/10.2173/bow.easowl1.01. Accessed 23 October 2021.

Tables: Tables, graphs, and line drawings should be created electronically in black and white. Color should only be used when absolutely necessary for clarity.

Illustrations: Photographs or high-definition images may be accepted if necessary or desired by the author(s) to support the text. Photographs should be submitted in color. Figure numbers, as cited in the text, and figure legends should be keyed to each respective photograph.

Maryland Birdlife is published twice annually to record and encourage the study of birds in and around Maryland. ***Maryland Birdlife*** contains original articles, notes, and research papers primarily pertaining to Maryland and the Mid-Atlantic region. Potential topics may include geographic or temporal distribution, ecology, biology, morphology, systematics, behavior, migration, life history, as well as other biological topics. Annual bird counts also will be published. All submissions are subject to editorial review and acceptance. Articles and research papers will be peer-reviewed. Please e-mail submissions to Editor Eugene J. Scarpulla at birdlife@mdbirds.org.

Maryland Ornithological Society, Inc.
4915 Greenspring Avenue
Baltimore, MD 21209

Maryland Birdlife
Published Semiannually by the Maryland Ornithological Society, Inc.

Editor: Eugene J. Scarpulla, 14207 Lakerun Court, Bowie, MD 20720-4861
birdlife@mdbirds.org
Associate Editor: Mark S. Johnson, 3204 Bryson Court, Baldwin, MD 21013
MarkSJohnson2@gmail.com

CONTENTS – FALL 2021

Editor's Note
Eugene J. Scarpulla 1
Descriptions of Maryland Birds by Colonial Naturalist Henry Callister
Ellen M. Lawler and Sarah A. Rubin 2
Avian Predation on Brood X 17-year Periodical Cicadas, *Magicicada* spp. (Hemiptera: Cicadidae), in Elkton, Cecil County, Maryland in 2004
Marcia R. Watson 23
2020 Maryland May Count: Corrigendum
..... 24
Quantifying the Recovery of the Active Nesting Bald Eagle (*Haliaeetus leucocephalus*) Population in New Jersey
Megan A. McKay, Baoling Ma, and Lisa E. Marano 25
Nesting of the Peregrine Falcon *(Falco peregrinus*) in Maryland Since Reintroduction of the Species
Glenn D. Therres, Craig A. Koppie, and Matthew T. Olear 41
A White-Throated Sparrow, *Zonotrichia albicollis*, with Probable 'Progressive Graying'
W. Scott Young and Lynn H. Gregg 71
Maryland Christmas Bird Counts (121th CBC) – December 2020 through January 2021
John B. (J.B.) Churchill 75
2021 Maryland Mid-winter Bird Count
Erika L. Norton 89
2021 Spring Raptor Migration at Fort Smallwood Park, Anne Arundel County, Maryland
Sue A. Ricciardi 94